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THE IRON TRADE REVIEW

VOLUME XXXI. CLEVELAND, O. APRIL 21, 1898. CHICAGO, ILL. NUMBER 16

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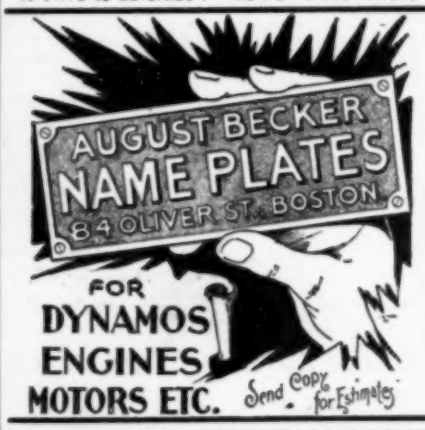

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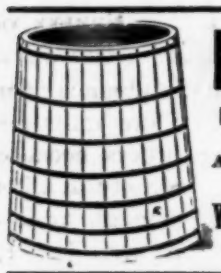

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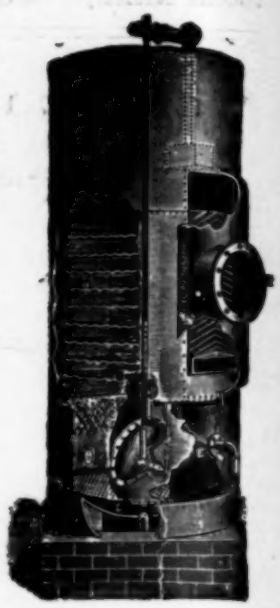

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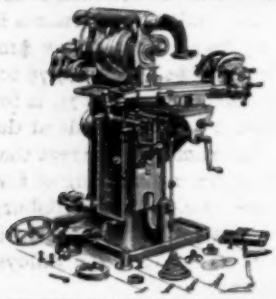

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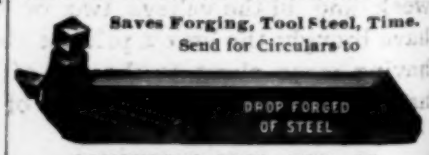

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THE IRON TRADE REVIEW

VOLUME XXXI. CLEVELAND, O. APRIL 21, 1898. CHICAGO, ILL. NUMBER 16

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Even with the probability of war changed to a practical certainty, the iron trade has kept on doing business on a large scale. Postponement of action is still the rule in certain lines, notably in structural steel; but there is a greater unanimity than might have been expected, in refusing to consider the Cuban situation, as it has finally developed, as a serious menace to business. There may come unpleasant surprises, but to-day the situation is one of confidence and the iron trade generally is acting on the belief that there will be a short war, with a minimum of industrial interruption, and afterward such a plethora of orders, from the coming out of what is now held up, as shall make 1898 a signally conspicuous year. The disturbance of our export trade is one hardship anticipated, and some slackening is already noted. The certainty that the supply of Spanish ores delivered at the Atlantic coast will be cut off is being reckoned on, but Lake Superior mines can supply the deficiency, though at slightly higher delivered cost. The only question will be whether grades desired can be supplied, now that the old-range Bessemers have been so largely taken. An indication of the opportunities of seaboard works, under favorable conditions, is the Russian order for 35,000 tons of rails closed in the week by Sparrow's Point. Transport is arranged by the buyers, the price being made on ship. The week has given further emphasis to the exceptional melt of iron in Chicago district foundries, sales of both coke and charcoal iron running well up. Charcoal iron is showing steady stock reductions under recent heavy buying, and with the present rate of consumption kept up stocks promise soon to be at the lowest point in several years. Moreover, producers of charcoal iron find in the recovery of some of the ground lost to coke Bessemer the assurance that their product will always have a place, especially if cost is kept down by charcoal by-product recovery. In Central Western districts and in the East the foundry buying of the week has been in small lots, but the evidences of large consumption continue, and when free contracting again becomes the rule an enormous tonnage is expected. The latest proposal before the Central Western producers of Bessemer iron is to secure agreement to a 30-day banking by each furnace at some time in the next 90 days. The plan has the assent, it is understood, of nearly all the producers who have attended the recent conferences. New car work has brought some large contracts to the bar mills in the past week, and in the valleys two or three round lots have brought the lowest price of the year, the mills having come about to the end of specifications on hand. On some recent orders of smaller amount Pittsburg mills have secured a slight advance over the lowest figures on steel bars. Plate mills are well filled and some are refusing orders because prompt deliveries cannot be made. Structural mills are occupied for the present, and though an immense tonnage has been figured on since Jan. 1, specifications are withheld. The wire and wire nail markets have been upset by some low quotations from an interest without rod mills and having limited capacity for wire and nails. While $1.25 and a shade less has been quoted on wire nails, it does not appear that jobbers have accepted these tenders, and meantime the largest producer is holding at $1.35 for nails and $1.10 for smooth wire. Little is doing in wire rods, but prices are lower and some Pittsburg business has been done at $21.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
508 TRADESMEN'S BUILDING, April 20.

Notwithstanding the Cuban situation, the tonnage at Pittsburg mills grows larger daily. A leading pipe mill has withdrawn from the market on sizes below 4 inches; on plates another mill is filled for two months and the first heavy demand for iron bars in months is now on. On the other hand, much work is known to be delayed by the fear of war; ordinarily it would have been placed before this. The war operations are responsible for two orders of the week, one for plates for torpedo boats and the 2,000 tons of shapes for coal docks at Dry Tortugas and Key West.

PIG IRON.—The trading in Bessemer iron is confined to the stocks held by outside interests. No selling by furnaces is reported, nor is iron being quoted by furnacemen below $10, at furnace. The iron sold has brought $9.65 and $9.75 for April delivery. One lot of 5,000 tons, sold at $9.75, is for delivery during May, while a 1,300-ton sale was made at the same price, delivery this month. The rumor is current that the associated furnaces contemplate a general banking of furnaces in May. Foundry grades are weaker and Pittsburg sales of No. 2 have been made as low as $9.75. Gray forge is firm at $9.25, Pittsburg, and $8.75 and 8.85 in the valleys. Quotations in Pittsburg are as follows:

Bessemer, valley	$ 9.75	to	10.00
Bessemer, Pittsburg	10.40	to	10.65
No. 1 Foundry	10.40	to	10.50
No. 2 Foundry	9.90	to	10.00
No. 3 Foundry	9.50	to	9.75
Gray Forge, valley	8.75	to	8.85
Gray Forge, Pittsburg			9.25

STEEL.—Rods feel the drop in nails and are again lower—$21, maker's mill. Billets are quoted at $15, Wheeling and valley, and $15.25 Pittsburg, maker's mill. Tin bars are $17 in the valleys and Wheeling, but are being sold at less. Pittsburg prices are slightly higher, $17.25, maker's mill, being quoted.

SHEETS.—Some of the more hungry mills continue to take long deliveries at low prices, notwithstanding the fact that sheet inquiries are heavier and there are signs of reviving buying. No. 28 for a week has been selling at 1.95c and less, and 1.95c is now a common quotation. A check in the cheap selling is expected to result from the manufacturers' meeting here this week. Indications multiply of a heavy season when international affairs shall have become more settled. Galvanized sheets are weak, too, and are quoted at 80 and 7½ per cent off list with customary freight allowances.

FERRO-MANGANESE.—A number of good-sized sales of ferromanganese have still further reduced the available supply. The local producer is now quoting $49 and $49.50 for 80 per cent, and little is to be had. The sales made were at $48.50 and $49, Pittsburg. The foreign is taking the place of the domestic during the famine.

PLATES.—The plate business in the last ten days has comfortably fixed Pittsburg producers for some time ahead, one heavy manufacturer being booked for six weeks. Among the plate business known to be tied by the Cuban matter are some steel car orders. Until some issue in foreign affairs comes no letting will be made. An order for 150 tons of light plates for torpedo boats came to a local mill in the week and shipment was made at once. Mills quote: Tank, Bessemer and open-hearth, 1c to 1.05c; shell, 1.10c; flange, 1.20c; fire box, 2c and upwards.

PIPES AND TUBES.—That the pipe market has been bothered by low prices rather than a lack of orders is evidenced by the withdrawal from the market of a large local mill on all sizes under four inches. In no department is there lack of tonnage, and the concerted action of the mills is looked to as the turning point in prices. So far the extra discounts—six tens and 5 per cent—are the market. The base discounts are: Butt weld, black, 57 per cent off; lap weld, black, 67 per cent off; butt weld, galvanized, 50 per cent off; lap weld, galvanized, 55 per cent off. Discounts on merchant boiler tubes are as follows: 2¼ inch and smaller, 72½ per cent off; 2½ inch and larger, 75 per cent off.

STRUCTURAL MATERIAL.—New business is much impeded by the Cuban situation, and on this account the season is slow in developing. Neither of the Pittsburg structural mills is in any need of tonnage, but if work is postponed much later a scramble for deliveries may come later in the summer. An order, hurried by the prospects of trouble with Spain, was the material for the Government coal docks at Dry Tortugas and Key West, which was placed Saturday with a Pittsburg mill. Something over 2,000 tons of shapes is included. Pool prices quoted by the mills are as follows: Beams and channels, 3 to 15 inches, 1.15c; 18 to 24 inches, 1.25c; tees, 1.20c; zees, 1.15c, and angles, 1.05c. Universal plates in connection with shapes are selling at 1c; alone, at 1.10c.

RAILROAD AND TRACK MATERIAL.—Advices from the East are that the rail contract for the Trans-Siberian Railway has been awarded by the Russian Government to the Maryland Steel Co., and that deliveries are to begin at once. The local mill was not a bidder. Rails are quiet at $18, Pittsburg, and track material is quoted as follows: Iron track bolts, 1.65c to 1.70c; steel spikes, 1.45c to 1.55c; splice bars, 1.10c to 1.15c; links and pins, 1.20c.

SPELTER.—Prime Western spelter is fluctuating less and is now steady at $4.20 and $4.22½.

BARS.—Owing to car specifications, bar iron has been in heavy demand, and the first large sales for some time are reported from the valley. The largest of these was for 12,000 tons, and was placed with a valley mill. As a result of the buying prices are higher, and 95c flat is held at several mills. Signs of weakening are again reported in steel bars, although no Pittsburg mill quotes less than 95c, and two mills ask 1c.

IRON AND STEEL SKELP.—Steel skelp is slightly higher. We quote: Grooved steel skelp, 1c to 1.05c; sheared steel skelp, 1.05c to 1.07½c; grooved iron skelp, 1.05c to 1.10c; sheared iron skelp, 1.12½c to 1.15c. All four months, f. o. b. buyers' mills, or 2 per cent off for cash.

OLD MATERIAL.—Sales of the week were on the basis noted. Old iron rails at $13.75, valley; No. 1 wrought at $11.75, net; wrought turnings at $7.50, gross; No. 1 cast at $9.50, gross; and heavy steel melting scrap at $11.75, gross. Other quotations are: Steel rails, $10.50; car wheels Pittsburg, $10.25, gross; heavy melting stock, $10.75, gross; busheling scrap, $9.50, net; cast borings, $5.75; billet and bloom ends, run of mill, $11.

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.* 27 VINCENT ST., April 20.

Preparations are making for the loading of the first boats at the head of Lake Superior, and by the end of another week some of this ore will be on Lake Erie docks. From Two Harbors the first ore down will probably be the 12,000 tons of Sparta loaded into boats at the close of last season. Vessel rates show no change for the better. Some short season business from the head of the lake has been done recently at 60 cents, with 50 cents as the corresponding rate from Marquette. Some wild charters from the latter port have been made at 50 cents. The record of last season for low freight from Escanaba to South Chicago has been broken by charters of last week on the basis of 18 cents, free in and out. The anomaly of higher ore prices than last year's, and yet the lowest recorded vessel rates, and, for Gogebic and Menominee ores, the lowest rail freights, is still unexplainable. Shipments of ore from docks to furnaces have been heavy of late, and while there is yet an abundance of dock ore, certain grades will be wanted by furnacemen just as soon as they can be brought down. While close to 9,000,000 tons of 1898 ores are already placed, the Mesabi movement is still in abeyance. Some pace-setting sales are likely within the next fortnight, however.

PIG IRON.—A proposition which the valley furnacemen's committee is considering to-day comes back to what was the starting point with some of their number. After canvassing various plans for curing demoralization, including selling agency and incorporation propositions, the idea now discussed is to have every furnace in the arrangement shut down for a 30-day period at some time in the next 90 days. This is a simple and effective way of removing surplus and preventing accumulations and is calculated to test the amount of real desire every furnaceman has to bring about a better condition. It is reported that nearly all valley firms have signified a willingess to co-operate in the movement. For the two furnaces that are out and the two soon to go out for repairs, the proposal involves no unexpected hardship. In a few cases there may be reasons that prevent stopping. What to do with these is the problem to be worked out. While there has been little or no selling of Bessemer iron the past week except from middlemen's stocks, a few thousand tons at $9.65 and $9.75, valley furnace, there is heavy consumption, and there was some reduction of these stocks last month. Some further Pittsburg buying for second quarter is not unlikely. The foundry iron trade is in small lots but without interruption, and the current melt in local foundries is large. For No. 2 some furnaces ask $9.75, and $9.50 is the usual minimum. Charcoal iron stocks have been steadily reduced of late, and the higher numbers are particularly scarce. We quote, f. o. b. Cleveland:

Bessemer, second quarter	$10 65	Valley Scotch No. 1	$10 65@10 75
No. 1 Strong Foundry	10 65	Valley Scotch No. 2	10 25@10 40
No. 2 Strong Foundry	10 15	Gray Forge	9 40
No. 3 Foundry	9 65	Lake Superior Charcoal	11 50

FINISHED MATERIAL.—Plates and shapes for a ferry steamer to be built at the Globe Iron Works were let the past week, the plates going to Cleveland and the shapes to Pittsburg. The total is 1,000 to 1,200 tons. Several good bar iron contracts for car works have been taken by valley mills, but prices were cut, a flat price of 1c delivered being made in one case where the freight was 8½c, while half extras ordinarily would have averaged 5c. Yet the tonnage was considerable and the specifications attractive. Some local sales of steel bars are also reported. Sheets have sold in small lots on a basis of 1.95c at mill for No. 27. Pipes and tubes show a stronger feeling, mills being better sold up, and some recent quotations being withdrawn. Plate mills are sold some weeks ahead, and with some, prices are held a trifle higher. The wire and nail situation has been disturbed by some low quotations from a seller whose capacity is limited and whose rod supply is mysterious but presumably small. The larger producers are quoting $1.10 on smooth wire and $1.35 for wire nails, but these figures have been cut by circular quotations from the seller referred to. The effect is to upset buyers for the moment and cause a halt at a time ordinarily full of business in this line. The war situation is also holding back business in these lines.

CHICAGO.

OFFICE OF *The Iron Trade Review and Industrial World.* 1142 MONADNOCK BLOCK, April 20.

While some consumers appear to have postponed buying, the market, generally speaking, continues to be very active. Very heavy buying has been done in pig iron in the past 10 days, the larger part of it going to the Southern furnaces. Users of steel are buying considerable quantities, in some instances, while other buyers are buying only in a small way until the political situation clears up. Some large contracts in plates which were expected to be placed before this, have been postponed. Car works are still large buyers of material, and give every prospect of continuing to purchase heavily.

Bar iron consumers have placed some large orders, and considerable figuring is done on further business.

PIG IRON.—Sales of at least 20,000 tons of Lake Superior charcoal iron and 20,000 tons of Southern coke iron have been made in the past two weeks or 10 days, nearly all of the former and a large share of the latter to the Griffin Wheel Co. Of the charcoal iron an order for 10,000 tons was given to Pioneer furnaces, 6,000 tons to Spring Lake furnace, and the balance to Detroit furnaces. In addition there were several smaller sales to various consumers. The 20,000 tons of Southern iron was nearly all in large lots, but the small lot business has been very good, and there is every prospect of its continuing so. There are a good many buyers in this market who have not placed their requirements for the next six or nine months, and these will buy fully as much as in previous years, and probably more. The agricultural implement makers have had a very large business for some months past, and expect the pace to continue. Only a few of this class of customers have placed large orders recently. Malleable foundries are all working full, and with the present demand for their product will continue to do so for an indefinite time. They have been large buyers of late. Machinery founders find trade getting better all the time, and general jobbing founders, both large and small, are doing more than in years. Everything considered, it would appear that the pig iron business during the balance of this year, at least, will be larger than ever before in this territory. The Southern furnaces have been getting the bulk of the business, because their prices are so much lower than those of the Northern makers. In spite of this fact, however, the latter have had no difficulty in selling enough to keep their order books full for the balance of the year, and are finding purchasers for about their output every week. A meeting of foundry and forge pig iron producers is to be held in New York this week, at which it is hoped something can be done that will support the market by disposing of weak iron. It is expected that fully 95 per cent of the producing capacity of the country will be represented at the meeting.

Lake Sup. Charcoal	$11 00@11 50	South'n Coke No. 3	$10 10@10 35
Local Coke Fdy. No. 1	11 50@12 00	Southern No. 1 Soft	10 60@10 85
Local Coke Fdy. No. 2	11 00@11 50	Southern No. 2 Soft	10 35@10 60
Local Coke Fdy. No. 3	10 75@11 00	South'n Silveries	11 25@11 50
Local Scotch Fdy. No. 1	11 50@12 00	Jackson Co. Silveries	12 50@14 50
Local Scotch Fdy. No. 2	11 00@11 50	Ohio Strong Softeners	12 00@12 25
Local Scotch Fdy. No. 3	10 75@11 00	Alabama Car Wheel	14 00@16 00
South'n Coke No. 1	10 60@10 85	Malleable Bessemer	11 50@12 00
South'n Coke No. 2	10 35@10 60	Coke Bessemer	11 50@12 00

BARS.—Sales in the week have included several orders of good size, notably one of over 4,000 tons. The demand for bars from all classes of customers has been good, and shows every sign of keeping up. Prices are unchanged, but some mills report a firmer feeling and entertain hopes that quotations will be higher within a short time. Some of the mills in this territory have about filled their order books for the next two or three months. Common iron is quoted at 1.05c to 1.10c; guaranteed, 1.10c to 1.15c; soft steel bars, 1.15c to 1.20c.

CAR ORDERS.—Two or three fair orders were given out last week, and several contracts for round lots are expected to be placed soon. Illinois Central has asked for figures on 1,500 cars. Considerable car material is being ordered every week.

RAILS AND TRACK SUPPLIES.—Very little business was done last week by the local mills, and the larger part of it was in light sections. The demand is not so heavy for these as it was a week ago. Quotations are as follows: Rails, $20 to $22.50, according to specifications; steel splice bars, 1.15c to 1.25c; track bolts, with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.50c to 1.60c.

BILLETS AND RODS.—A sale of 3,000 tons of billets was made in this market last week by a Central Western concern, the price being considerably under $17, Chicago. No other sales are reported. Billets are now quoted at $16.50 to $17, and rods at $23.25 to $23.75.

STRUCTURAL MATERIAL.—Bids were opened last week on material for the extension to the Lake St. Elevated, taking about 2,800 tons. The contract for the track elevation of the C. M. & St. P. Ry., amounting to 3,000 tons, was let to the Lassig Bridge & Iron Co., the steel to be made by the Carnegie Steel Co. No other large contracts were placed or came up to be bid upon. General business has been quite good, and small orders are frequent. Quotations are made as follows: Beams, 15-inch and under 1.30c to 1.35c; 18, 20 and 24-inch, 1.40c to 1.45c; angles, 1.20c to 1.25c; plates, 1.15c to 1.20c; tees, 1.35c to 1.40c. Small lots from stock are quoted at one-quarter to one-half cent higher.

PLATES.—Some business was done in plates last week, but it was limited to small lots in all but one instance. One contract for 1,000 tons is understood to have been placed. Several contracts which were to have been placed before this have been held up pending the settlement of the Cuban situation. Prices are firmer, and are made as follows: Tank steel, 1.15c to 1.20c; flange steel, 1.20c to 1.40c; fire box steel, 1.85c to 5c.

MERCHANT STEEL.—Considerable business was done last week, most of it in small lots, although one or two good-sized contracts were placed. The demand appears to be holding up well, and a good business is looked for in the next several weeks. Prices follow: Open-hearth spring, tire and machinery steel, 1.60c to 1.70c; smooth-finished machinery steel, 1.60c to 1.65c; smooth finished tire, 1.50c to 1.60c; tool steel, 5.50c to 7.50c; specials, 11c and upwards

SHEETS.—Sales have been fairly good, and included some quite large contracts. Inquiries point to a continuance of the good business. Quotations are made at 2.05c to 2.15c for No. 27 black, and 80 and 7½ to 80 and 10 per cent discount for galvanized.

SCRAP.—There has been very little business in the past week. Old rails appear to be in larger supply, and the price is consequently slightly weaker, although no changes have been made. One or two sales of small lots of old wheels were closed last week. Dealer's selling prices are as follows:

Old iron rails, gross	$12 00@$12 25	Axles, net	$14 25@$14 75
Old steel rails, long, gr.	10 50@ 11 00	Cast borings, net	4 00@ 4 25
Old steel rails, short	9 00@ 9 25	Wrought turnings, net	5 50@ 6 00
Old wheels, gross	11 00@ 11 50	Axle turnings, net	6 25@ 6 75
Railroad forge, net	12 00@ 12 50	Mixed steel, gross	7 25@ 7 50
Dealer's forge, net	10 50@ 11 00	Stove plates, net	6 00@ 6 25
No. 1 mill, net	7 50@ 8 00	Heavy melting steel, gr.	8 25@ 8 50
Heavy cast, net	8 50@ 9 00	Old iron splice b., net.	13 25@ 13 50
Malleable cast, net	8 00@ 8 50		

CINCINNATI.

April 19.

In the past week the number of furnaces that resumed blast equalled the number that suspended operations, so that the large March output is being maintained. Consumption keeps up well, and apparently is a little ahead of production, as stocks of coke and charcoal irons at the furnaces are evidently being slightly reduced. The transactions in pig iron during the week in this district have been quite numerous, but not for large quantities. We quote for cash f. o. b. Cincinnati: Southern coke, No. 1 foundry, $9.75; No. 2, $9.50; No. 3, $9.25; gray forge, $8.75; mottled, $8.75; No. 1 soft, $9.75 to $10; No. 2, $9.50 to $9.75; Belfont coke, No. 1, Lake Superior, $11 to $11.50; Belfont coke, No. 2, Lake Superior, $10.50 to $10.75; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Tennessee charcoal, No. 1, $12.50 to $13; Jackson Co. silvery, No. 1, $12.50 to $13; Standard Georgia car wheel, $14.25 to $15.

PHILADELPHIA.

April 19.

Uncertainty has dominated the local iron market the past week, yet demand has not ceased. The necessities of many melters of iron have brought them into the market, even though no single transactions of large amounts are reported. Doubtless the influence of the impending war is more sharply felt here than in the western districts, the export interest at the seaboard being influenced by the certainty that ocean transport will be precarious for some time to come. The situation as to pig iron stocks is better than was to be expected, the Western Pig Iron Association's report for March showing a reduction of 15,000 tons in coke iron in March, while charcoal iron was reduced 10,000 tons, but this was offset by a gain of 10,000 in anthracite stocks, making the net reduction 15,000 tons. The statistical position is thus encouraging. Prices of pig iron are stationary. Some sales have been made on the basis of $10.75 for No. 2X, $10.25 for No. 2 and $9.75 delivered for No. 3 foundry. The quoted basis is $11.75 for No. 1X, $10.75 to $11 for No. 2X and $9.75 to $10 for ordinary mill irons. Shipyard activity has filled up plate mills, making this the most active department. Refined iron bars are on a basis of 1.10c to 1.15c; steel bars, 1.15c; plates, 1.15c; angles, 1.20c; beams and channels, up to 15 inches, 1.30c.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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APRIL 21, 1898.

WAR STIMULUS TO SHIPBUILDING.

The American people have had an impressive object lesson in the past few weeks, of the cost of preparation for war with one of the less important of the powers of Europe. In the months ahead demonstration will come, such as the present generation has not known, of the costliness of conflicts between nations. Something can be gathered from what has been spent, and from the expenditure yet to be made, of the exceptionally favored condition of the American people in the past 3c years, in their freedom from the burden of armament maintenance. But the important fact in connection with the recent heavy outlay of the United States Government is that the present crisis marks the inauguration of a new scale of appropriations for National defense. It is true that a beginning was made 12 years ago in the building up of a navy, but the appropriations have been fought year by year, and there was no assurance that the policy of one administration would be persisted in by the next.

The complications with Spain are reinforced by other considerations, that determine beyond peradventure the attitude of every administration and every Congress on this subject for years to come. We refer more especially to the rapid development of export trade in all lines of American manufactures. As long as the people of the United States traded largely with themselves, or at least found no necessity for an aggressive export policy, because the prices of their products put them hopelessly out of competition, they found it easy to mind their own affairs and to avoid foreign complications. Now that trade contact with other nations is sought, and sought eagerly, the possibilities of foreign complications have been greatly increased. In the Cuban troubles, while humanitarian rather than commercial considerations have been uppermost, it has been demonstrated how commercial relations lead to entanglements and add their aggravation, in strained situations.

To be in position for offense and defense under the regime upon which the country is just entering will require that the United States be prepared to join issues with any of the first-class powers of Europe. What this means to shipbuilding and allied interests, and to the iron and steel industry at large, can be better appreciated than ever in view of the preparations the country is now witnessing. When it is considered that the Government's recent purchases of American vessels for war and transport service had amounted at the beginning of the present week to 85,669 tons, there being 28 steam vessels, steamships, yachts, tugs and freighters, and that in the fiscal year ending June 30, 1897, the tonnage of iron and steel vessels built on the Atlantic a Gulf coasts was but 21,586, or one-fourth as much, some idea can be formed of the industrial significance of a strong naval programme by the Government.

In each of the last two years Great Britain's naval appropriation has been $100,000,000 in round numbers—£21,838,000 in 1897 and £21,823,000 in 1896. Last year's additions called for four battleships, three third-class cruisers, two sloops, four twin-screw gunboats and two torpedo boat destroyers. The total of vessels under construction last year for Great Britain was 108, with an aggregate displacement of 380,000 tons. The programme for 1897 called for the completion of 66 within the year, including 50 torpedo boat destroyers.

Should this country hereafter undertake but a modest fraction of what is indicated in this typical schedule for British navy building, it can be seen that the stimulus to the iron and steel industry will be prodigious. The appropriation bill now in conference at Washington, having already passed the House, calls for an outlay of $15,000,000 to $20,000,000 in the next year in the construction of new battleships, monitors and torpedo boats. This will go in large part to the iron industry, and that its expenditure will be an important element in bringing prosperity to the trade need not be said.

Another factor in this connection is the immense volume of work that will come to our shipyards at once in the replacement of the vessels which the Government has taken out of the merchant service. As noted above, if all these vessels are replaced, the shipyards of the Atlantic and Gulf coasts would have four times as much work in iron and steel tonnage in the next year as in all the fiscal year 1897. This will certainly meet a condition on which stress was laid by W. I. Babcock, general manager of the Chicago Shipbuilding Co., in reviewing for the *Marine Review* the shipbuilding congress in England last year. Mr. Babcock said that the great drawback to our shipyards thus far had been the variable quantity of work on hand. A few orders happening to come together crowd the yards with work for a few months, making it difficult to secure men enough. Then with bare stocks and empty shops for a time, the men scattered, even foremen, draughtsmen and office force being cut down. The serious effect on the organization of any yard is readily seen. Mr. Babcock was confident, however, in the light of his investigations at England shipyards, that given the same steady operation of plants in this country, with capital available for new and

great shipyards, modern in every respect, our skilled labor, our efficient labor-saving machines, and our cheap steel, would make it possible to build cheaper ships in the United States than anywhere else in the world.

The regime of full operation which has been lacking heretofore has now come, it would seem, and come without the asking. It will afford opportunity for a demonstration of the possibilities of cheap shipbuilding, never before available since steel vessels displaced wooden craft. The war may have this as one of its compensations, that it will make possible the establishment of our shipbuilding industry on firmer basis than has been known since the ante-bellum days of our wooden shipbuilding supremacy. And if we mistake not, the investment in a great modern shipyard at or near New York, as suggested in Mr. Carnegie's recent letter, will come more speedily than was even in the thinking of the writer himself.

PERSONAL.

The board of directors of the Carnegie Library, Braddock, Pa., received a cablegram last week, saying that Mrs. Andrew Carnegie had notified her New York agents to purchase a $10,000 pipe organ for the Braddock library. Mr. Carnegie will present a $5,000 organ to the chapel of St. Joseph's Academy, Greensburg, Pa.

J. Brentnall Duckett, mechanical engineer, who is connected with the Manchester, Eng., boiler and engineering works of Adamson & Co., is in the United States looking into electrical equipment. He was at Cincinnati last week.

C. A. Boyd, whose resignation as superintendent of the Walker Co., Cleveland, has been noted, has been succeeded by Chas. W. Black, formerly connected with the Brush Electric Co.

J. F. Robinson, of the well-known Pittsburg firm of Robinson & Orr, was married last week to Miss Sarah N. Arbuthnot, daughter of the late Charles Arbuthnot, of Pittsburg.

C. P. Coleman, formerly general storekeeper of the Lehigh Valley Railroad Co., has resigned, to accept the position of purchasing agent of the Bethlehem Iron Co., South Bethlehem, Pa.

Sheet Manufacturers' Meeting.

The monthly meeting of the Sheet Manufacturers' Association, postponed from last week, was held on Tuesday, in Association headquarters in the Conestoga Building, Pittsburg. Nineteen firms were represented. The suggestions regarding scale changes sent in by the various lodges of the Amalgamated Association preliminary to the workers' annual convention were in the hands of the association, and were discussed at some length. Few changes are made in the present scale, and indications are that as finally agreed to by manufacturers and men it will not differ greatly from that now in force. Another meeting of the manufacturers will be held before the Amalgamated Association's convention in May.

Specific Gravity Tests of Cast Iron.

The experiments referred to below were conducted by Thos. D. West at the request of Capt. Henning, of Berlin, and were presented to the German foundrymen's meeting held in Berlin, Feb. 7, with other matter from Mr. West:

To obtain specific gravity tests of small roll castings (as requested by Capt. Henning) having one end chilled and the other all gray, when inserted vertically in a bath of metal, having like composition when solid, the following plan was followed: I cast rolls about 12" long by 2⅜" diameter, 6" of which were cast in an iron mold and 6" in sand, formed both together, the iron mold being in the bottom and the sand mold formed on top of it incased in a wooden frame. Accompanying these several combined chill and sand roll castings I cast rolls 6" long in an iron mold and some in an all-sand mold—the two molds being separate—with the same ladle of iron, thus giving three distinct bodies to test the specific gravity of the same iron. In the first two descriptions of molds mentioned I cast a rod of ¼" iron about four feet long. These rods I marked off with chalk at spaces 6" apart, so that when the rolls were immersed in the metal I could tell by the chalk marks how far each sank, and their action in rising as the bodies enlarged by reason of increased temperature. The half chill and sand rolls (the chilled part being the lower end) would sink about one foot below the surface, remaining vertically at this depth about one minute, when the ¼" rod would show that the roll was rising and gradually assuming a diagonal position, finally resting in a position which displayed the sand part of the casting, leaving the chilled body slightly covered with the liquid metal. In testing the specific gravity of the chilled rolls they would, upon being first immersed, sink about 30" below the surface, holding this position for several minutes; then they would gradually rise to a position making them barely visible at the metal's surface. In testing the gravity of the all-sand rolls they would, upon being first immersed, sink slightly below the surface for the first half minute, and then gradually rise, protruding above the surface about ⅛", whereas the chilled body was barely visible. These tests were made with an iron having silicon, about 1.60; sulphur, .04; phosphorus, .09, and manganese, .50. Had the composition of these rolls been such as to give a harder iron, or one chilling all the body of the roll when cast in an iron mold, the chilled bodies would have sunk deeper and maintained a level 12" or more below the metal's surface at the end of their extreme rise in temperature. These experiments, combined with those shown in my second paper on the "Comparative Fusibility of Foundry Metals," demonstrate that the question of specific gravity of cast iron is dependent upon its rate of cooling, as with the same iron a casting can be poured that, by rapid cooling, will have a density causing it to sink far below the surface and remain invisible, whereas by slow cooling the same iron will be less dense, as shown by protruding its body above the surface of the molten metal. It would appear that the question of specific gravity of cold iron immersed in molten metal requires a different consideration from that heretofore given.

THE American Steel & Wire Co. has put in force a new schedule of wages at its newly acquired plants in Cleveland. The consolidated plant is in operation in full. The HP Nail Works are still idle and no announcement of resumption has been made. At the old American Wire Co. plant one rod mill has started and other portions of the works will fall in line later. Geo. H. Schuler, manager of the company for the Cleveland district, says that in making the wage schedule the average of wages in all the mills of the new company was taken. At the Consolidated or Baackes mill, in Cleveland, this meant an increase of 10 per cent in some cases, and in the wire-drawing department of the American mill, Cleveland, a reduction of 3 or 4 per cent. In the rod mill, it is a reduction of less than 1 per cent for the rollers. The wages of the nail men have not been taken up, as yet. Common labor will receive $1.25, which in the case of a few mills is a reduction. Expected reductions in office forces have occurred in combining the Cleveland plants, and as was anticipated, a number of clerical positions have been abolished.

THE Lake Superior Consolidated Iron Mines has let a stripping contract for the Pillsbury mine at Hibbing, Minn., and the property will be worked on the milling system. The same company will operate the Duluth mine also this year. Duluth and Pillsbury ores together make up over 100,000 tons of the recent Carnegie purchases of Mesabi ores.

HERR KARL WITTGENSTEIN, of Vienna, whose iron and steel plant, employing several thousand men, is an important factor in Austria, was the guest of honor at a dinner given at Pittsburg, April 18, by President Schwab to the superintendents of the various plants of the Carnegie Steel Co., Ltd.

THE meeting of foundry and forge iron makers at New York, April 22, will be held at the Waldorf-Astoria. Correspondence in the past week showed that 95 per cent of the productive capacity of non-Bessemer iron in the country would be represented.

EVOLUTION OF MACHINE TOOLS.

Prof. Charles H. Benjamin, of Case School of Applied Science, read a paper before the Civil Engineers' Club of Cleveland, April 12, on "The Evolution of Machine Tool Design." It was very fully illustrated by lantern slides, many of them from negatives of machines in use to-day in shops in Cleveland and other cities. The speaker called attention to the way in which machines were built at first, of wood and stone, those being the materials easiest to procure and to work. Machines were at first very crude and of no particular design, although no doubt looked upon as a marvel of ingenuity by the builder and his friends. In building these machines the workman had decorated them in any manner that seemed to him pleasing, the decorations consisting usually of paneling, carving and similar forms of handiwork, this all being done to make the machine beautiful.

Attention was called to a few general principles in machine design, as follows:

The working or moving parts, being the thing desired in a machine, should be designed first, and the frame adapted to them. The dimensions of the working parts must be determined and the design of the frame completed, using care to put the metal in the line of stress and avoiding bending wherever possible. Superfluous metal must be avoided, and this excludes all ornamentation as such. It may be necessary sometimes to waste metal to save labor in finishing; and in

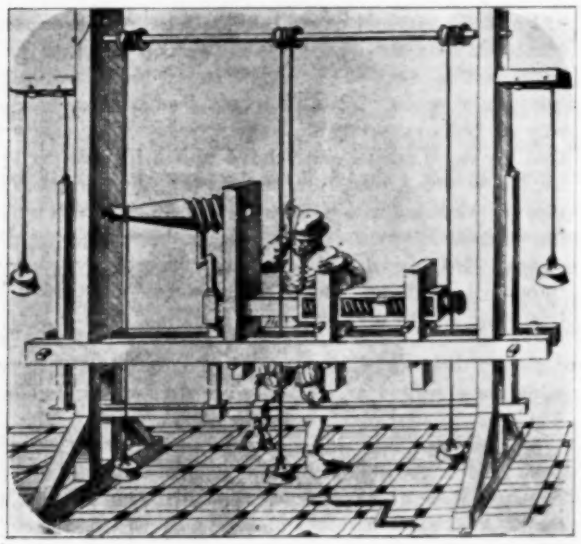


FIG. 1.

general the aim should be to save labor at the expense of stock, yet there should be a good practical reason for every pound of metal in the machine. The usual tendency in design, especially of cast iron work is toward unnecessary weight.

All corners should be rounded for the comfort and convenience of the operator. No cracks or sharp internal angles should exist where dirt and grease may accumulate. Special attention should be paid to so designing the machine that it may be conveniently and safely operated, that it may be easily kept clean, and that oil-holes are readily accessible. Polished metal should never obtain, on account of its tendency to rust, and the paint should be of some neutral tint.

While beauty is an element of machine design, it is the natural result of correct mechanical construction and should never be made the object of the design. Harmony of design may be secured by adopting one type of cross-section and adhering to it throughout, never combining cored or box sections with ribbed sections. The fewer the number of supports used the better, and all large machines are best made so as to rest directly on masonry foundations. Short frames, as those of shapes, screw machines and milling machines, should have one support of the cabinet form. If two cabinets are used provision should be made for a cradle or pivot at one end to prevent twisting of the frame by an uneven foundation.

A distinction must be made between cabinets or supports which are broad at the base and intended to be fastened to the foundation, and legs similar to those of a table or chair. The latter are intended simply to rest on the floor. They should be firmly fastened to the machine and should be larger at the upper end where the greatest bending moment will come. The use of legs instead of cabinets is an assumption that the frame is stiff enough to withstand all stresses that come upon it unaided by the foundation. Whether legs or cabinets are best adapted to a particular machine the designer must determine for himself. Where two supports or pairs of legs are necessary under a frame it is best to have them set a certain

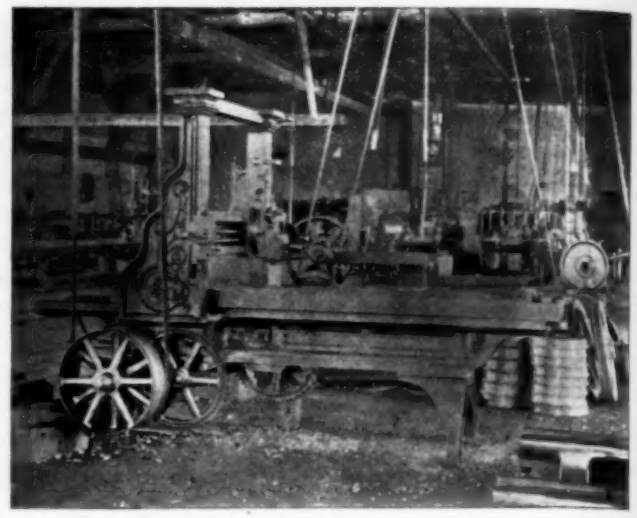


FIG. 2.

distance from the ends and make the overhanging part of the frame of a parabolic form, as this divides up the bending moment and allows less deflection at the center.

Trussing a long cast iron frame with wrought iron or steel rods is objectionable on account of the difference in expansion of the two metals and the liability of the tension nuts being tampered with by workmen. The speaker condemned the use on machine tools of the sprawling, double curved leg which originated in the time of Louis XIV., and which has served in

FIG. 3.

turn for chairs, pianos, stoves, and finally for engine-lathes and planers, as wrong both from a practical and an æsthetic standpoint. What is right looks right, and anything that is incorrect in principle looks ugly.

In speaking of ornamentation of machines by some designers, he referred to one builder who had gone down to posterity as advertising an upright drill designed in pure "Tuscan," and said many of the designs looked as if they had writhed

and squirmed up from the ground. In this connection he suggested that very likely the designer sketched in his ornamentation first and then built the frame around it, and in conformity to it. Prof. Benjamin also spoke of the gradual abandonment of ornament and of lines of double curvature, and the substitution of flat or single-curved surfaces, and of straight lines wherever possible.

Fig. 1 shows an old lathe used in France. This was built of wood, very crude yet is screw-cutting, has a countershaft and a lead screw. It is commonly called Besson's lathe, and dates back to 1570. Fig. 2 shows a lathe used in a Cleveland shop, and illustrates what was said regarding paneling, scroll work and the frame made to conform to the scroll. It also shows a very weak form of overhang at the ends. Fig. 3 illustrates the piano style of bed and legs, both being made up of double-curves and the whole being surmounted at the uprights by what was characterized as a triumphal arch. This also is in use in a Cleveland shop.

Mahoning Valley Industrial Notes.

Some increase in bar iron business has been noted in the past week, after a period of partial operation of mills. The Mahoning Valley Iron Co. is running fuller than for several weeks.

The Brier Hill Iron & Coal Co. put out its stack last week after a successful campaign. The stack will be relined, the tuyere area increased, and 500 h. p. of Stirling boilers added. It is the expectation to blow in in June.

Haselton Furnace of the Andrews Bros. Co. will go out about the end of the month. A new hearth and a new bosh will be put in and the number of tuyeres increased from seven to 12. In the yards bins will be provided for ore, coke and limestone, insuring the more economical handling of material.

The Finished Steel Co., Youngstown, O., has made a number of shipments of shafting abroad in the past few months, notably to Belgium and to the Manchester district, England. The plant is running quite full.

The Ohio Steel Co. has been keeping up its large output in the past few weeks. In March upwards of 39,000 tons of billets and sheet and tin plate bars were produced and shipped. The production of ingots in the month was 45,000 tons. The company is building an addition in which will be placed the monster guillotine shear, which is now about completed at the works of the Lloyd Booth Co. From the finishing rolls tin plate bars are conveyed in piles by crane, and with the new shear installed will be carried on feed rolls six at a time under the shear. Dropping upon a conveyor as they are sheared, the bars, cut to lengths with a nicety unattainable heretofore, will be loaded automatically into cars. A description of the shear which is the largest and most powerful ever constructed for the purpose, will be given in a later issue.

The Youngstown Bridge Co., which has taken possession of its new building in the past month, is occupied with a number of bridge contracts. The plant is well lighted and is equipped for the use of electricity as needed. Shears, punches and riveters are of modern pattern, a number of new machines having been installed. The company is equipped to handle a wide range of construction work, including the erection of steel buildings. Several experimental steel cars which it built for the P. & L. E. Ry. before the destruction of the old plant by fire are in use regularly on that road. The manufacture of these cars was interrupted by the burning of the works.

Foundrymen's Convention at Cincinnati.

The complete organization of the general committee of arrangements and the various sub-committees for the third annual convention of the American Foundrymen's Association, at Cincinnati, June 8, 9 and 10, is announced as follows: General chairman—Daniel McLaren, president of the Addyston Pipe & Steel Co.; treasurer, James A. Green, Matthew Addy & Co.; secretary, E. P. Wilson, secretary of the Board of Trade and Transportation. Finance committee—Chairman, J. W. Foley, J. W. Foley & Co.; Geo. McG. Morris, J. B. Morris Foundry Co.; Lincoln Haney, Globe Foundry Co.; Chas. Lang, Buckeye Foundry Co.; J. D. Smith, J. D. Smith Foundry Supply Co.; B. F. Haughton, Addyston Pipe & Steel Co.; Geo. A. Gray, Geo. A. Gray Co.; Charles Davis, American Machine Tool Works Co.; G. P. Egan, J. A. Fay & Egan Co.; Chas. Hoefinghoff, Hoefinghoff & Laue Foundry Co. Entertainment committee—Chairman, D. B. Meacham, Rogers, Brown & Co.; A. G. Wilson, Hoefinghoff & Laue Foundry Co.; S. H. Whittaker, Dayton Coal & Iron Co.; John Hill, Hill & Griffith Co.; Chas. Greenwald, T. & E. Greenwald Co. S. E. Hilles, Sam'l. C. Tatum Co.; C. H. Domhoff, Domhoff & Joyce Co.; Henry Scheu, Newport Iron & Brass Co.; Henry Frohman, S. Obermeyer Co.; Henry Gosiger, Eureka Foundry Co.; R. C. McKinney, Niles Tools Works, Hamilton, O.; T. P. Gaddis, Dayton Malleable Iron Works; F. X. Black, Black & Clawson Co., Hamilton, O.; C. S. Bell, Hillsboro, O.; W W. Hearne, Matthew Addy & Co. Reception committee—Chairman, Lazard Kahn, F. & L. Kahn & Bros., Hamilton, O.; H. M. Lane, Lane & Bodley Co.; Thos. Griffith, Hill & Griffith Co.; Wm. T. White, J. D. Smith Foundry Supply Co.; Wm. Gilbert, Buckeye Foundry Co.; W. J. Isaacson, Dayton Coal & Iron Co.; D. G. Johnson, S. Obermayer Co.; Edwin McFarland, Matthew Addy & Co.; John Fritsch, Fritsch Foundry Co.; C. B. Erhart, C. Erhart Foundry & Machine Co.; S. P. Jones, L. Jones Son's Co.; T. J. Joyce, Domhoff & Joyce Co.; Frank Klaine; Wm. Resor, Resor Foundry Co.; Geo. Webb, Industrial Foundry Co.; J. A. Oberhelman, C. F. Thauwald & Co.; W. C. Herron, Rogers, Brown & Co.; L. Walter, Thos. A. Mack.

CONDITION OF BLAST FURNACES OF U. S.*

April 1, 1898.

Location of Furnaces.	Coke and Anthracite.					Charcoal.				
	Total No. of Stacks.	In Blast. Number.	In Blast. Weekly capacity.	Out of Blast. Number.	Out of Blast. Weekly capacity.	Total No. of Stacks.	In Blast. Number.	In Blast. Weekly capacity.	Out of Blast. Number.	Out of Blast. Weekly capacity.
New York	18	3	4338	15	8017	5	1	115	4	448
New Jersey	5	2	1732	3	1327	.....	.....	.....	.....	.....
Spiegel	3	2	432	1	100	.....	.....	.....	.....	.....
Pennsylvania:						13	0	0	13	750
Lehigh Valley	37	9	5864	28	12580	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	100	.....	.....	.....	.....	.....
Schuylkill Valley	17	7	4992	10	5550	.....	.....	.....	.....	.....
Upper Susqu. Val	5	2	2085	3	1780	.....	.....	.....	.....	.....
Lower Susqu. Val	9	4	4812	5	2486	.....	.....	.....	.....	.....
Spiegel	1	1	354	0	0	.....	.....	.....	.....	.....
Lebanon Valley	12	8	6660	4	1803	.....	.....	.....	.....	.....
Pittsburgh	28	27	57305	1	2100	.....	.....	.....	.....	.....
Spiegel	2	2	2228	0	0	.....	.....	.....	.....	.....
Shenango Valley	17	11	16764	6	3260	.....	.....	.....	.....	.....
Jun. and Con. Vals	14	5	7931	9	4969	.....	.....	.....	.....	.....
Spiegel	1	1	474	0	0	.....	.....	.....	.....	.....
Youghiogheny Val	3	1	1186	2	1900	.....	.....	.....	.....	.....
Miscellaneous	5	1	1354	4	2889	.....	.....	.....	.....	.....
Maryland	5	2	3738	3	3870	4	0	0	4	574
Wheeling District	9	9	11636	0	0					
Ohio:						9	0	0	9	730
Mahoning Valley	11	9	15217	2	1857	.....	.....	.....	.....	.....
Central & Northern	11	11	15413	0	0	.....	.....	.....	.....	.....
Hocking Valley	12	6	2056	6	1689	.....	.....	.....	.....	.....
Hanging Rock	2	0	0	2	850	.....	.....	.....	.....	.....
Indiana	1	0	0	1	130	.....	.....	.....	.....	.....
Illinois	16	13	22895	3	3612	.....	.....	.....	.....	.....
Spiegel	1	1	1287	0	0	.....	.....	.....	.....	.....
Minnesota	1	0	0	1	629	.....	.....	.....	.....	.....
Wisconsin	4	3	3167	1	770					
Missouri	3	1	700	2	700	1	0	0	1	335
Colorado	3	1	1319	2	3620	.....	.....	.....	.....	.....
Virginia	21	7	4686	14	9430	4	0	0	4	437
Kentucky	6	4	1831	2	1450	3	0	0	3	200
Alabama	39	19	20367	20	13100	12	2	759	10	2350
Mich. and Wisconsin	.....	.....	.....	.....	.....	17	8	3923	9	2970
Tennessee	13	6	4900	7	3409	9	1	263	8	2420
Georgia	2	0	0	2	960	3	1	316	2	360
North Carolina	2	0	0	2	600	.....	.....	.....	.....	.....
New England	.....	.....	.....	.....	.....	11	2	160	9	858
Texas	.....	.....	.....	.....	.....	4	1	180	3	770
Utah	.....	.....	.....	.....	.....	1	0	0	1	175
Oregon	.....	.....	.....	.....	.....	1	0	0	1	275
Totals	340	178	227623	162	95537	97	16	5716	81	135 5

SUMMARY.

Fuel.	In Blast. Number.			In Blast. Weekly Capacity.			Out of Blast. Number.		Out of Blast. Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	16	16	16	5,716	5,470	5,368	81	81	13,552	13,777
Coke and Anthracite	178	177	137	227,623	228,962	167,911	162	156	95,537	94,737
Total	194	193	153	233,339	234,432	173,279	243	237	109,089	108,514

*Condensed from the *Iron Age*.

WILL THERE BE A PIG IRON FAMINE?

BY J. SCHOENHOF.

The *Statist* of March 12, under the above title, reviews the situation. After having made due allowance for the fact of the productive capacity of England, Germany and America being called upon to its fullest extent, it feels compelled to incline to an affirmative answer. In its number of March 26 the *Statist* publishes a letter from a Liverpool merchant in which grave doubts are expressed of the possibilities of such occurrence, and this entirely on account of American excessive production. The same idea is prevalent here. The effect of a fear of oversupply has certainly been sufficient to demoralize the market as much as if it had been a reality and not a vague apprehension. In point of fact the demand is greater than the supply, as stocks, in spite of the large output, are lower by over 200,000 tons than they were last July when production was at its lowest.

The bald statement of a product of two millions of tons in excess of the largest product of any preceding year might carry something of a discouraging character. But it is here that the erroneous impressions find their origin. The statistics of product alone do not convey the facts any more than one side of the ledger would give the standing of a firm. The silent facts, those generally omitted, however, give a different reading. Statistics must be comparative and include all concurrent facts, if they are to be of value in a commercial sense. I will try to collate all the facts bearing on this important question.

We start with the fact that by February production was carried on at the rate of about 11½ million tons against 9,652,000 tons, the product of 1897. But we have also to record stocks of 1,035,472 tons in July 1897, reduced to 803,000 tons by the later date. And at this present time all reports agree that the demand for all products of iron and steel, even under the threat of war, is so large that it is not possible to fill orders except at much delayed dates. The producers of pig iron find their industry in the same condition, so far as demand is concerned, and this is easily comprehensible.

The purposes for which iron and steel are used now are much more numerous than in 1890. The tonnage absorbed for structural purposes, buildings, underground construction, pipe lines, trolley and cable lines, barely thought of in 1890, is well up in the millions. Yet the product of 1890 was 9,202,000 tons; that of 1891, 8,280,000 tons; of 892, 9,157,000 tons (leaving out the years of panic, 1893 and 1894); the product of 1895 was 9,446,000 tons. Considering the reduced trade of 1896, running well into the fall of 1897 it is but a matter of course that a very great demand should set in after the appearance of favorable auguries; if only to make up for the falling out in the supply of the usual requirement cut short by the doubtful aspect of the preceding years. If 9,202,000 tons was a fair tonnage for the years 1890 and 1892, 11 to 12 millions would not seem excessive under a sitauiton created for 1898 by the stimulus which a long-deferred demand would give. But the case is stronger than these figures indicate.

The figures supplied by our foreign trade statistics materially affect the tonnage which we observe as an increase of the present time over six to eight years ago. And this is not taken into account when we compile statistics. Our imports in iron and steel and their manufactures in the five years up to 1892 averaged $47,000,000 a year. The bulk of these importations was in coarse products. These represented a tonnage of 1,573,000 tons in 1887; of 713,000 tons in 1890, and of 786,000 tons in 1891. If we add to the tonnage of 1891 the weight of manufactures represented only by value (about $8,000,000 in round figures) then 800,000 tons would be a fair estimate of the weight added to our home production of iron. In 1887 pig iron imports were at the rate of 418,919 tons; in 1891 they had fallen to 81,916 tons. The imports of 1891 are therefore proportionately larger in manufactures more advanced than pig iron, in which waste in conversion is no small factor. The consumption of products of iron and steel of foreign origin would therefore not be less than an equivalent of 900,000 tons of pig iron in the years 1890 to 1892.

The imports of 1897 were in products specified by weight and value 164,761 tons, and specified by value only, $5,000,000, which added on the same basis of computation would give us a total bulk of 175,000 tons, or an equivalent in pig iron of, say, 200,000 tons. Something like a full 700,000 tons is the annual demand on our pig iron producers to fill the gap created by the falling away of foreign imports.

This, however, is only one chapter in the changed condition of our foreign trade relations in iron. Our exports take about as much iron out of our market as the falling away of imports forces us to look for from home producers. Here are the figures upon which my estimate rests:

EXPORTS OF ARTICLES SPECIFIED BY WEIGHT IN TONS.

	1890.	1897.
Pig iron and scrap	18,458	305,155
Hoop and bar iron		...
Steel ingots, etc.	1,078	50,194
Plates and sheets		9,270
Rails, etc.	10,236	154,577
Nails	6,660	24,470
Wire	9,780	54,000
Structural iron		15,072
Total tons	46,212	612,738

To this has to be added the iron contained in highly finished articles of manufacture. Of these we only have the value recorded. A comparison of these is very instructive:

EXPORTS OF MANUFACTURES OF IRON AND STEEL, WITH VALUES ONLY GIVEN.

	1890.	1897.
Builders' hardware, etc.	$3,850,000	$6,405,000
Machinery	14,228,000	30,110,000
Pipes and fittings		1,252,000
All other manufactures	3,763,000	11,033,000
	$21,851,000	$48,800,000

In these exports I have not included cutlery, firearms, bicycles, instruments and apparatus, nor cars or their parts, carriages, plows and agricultural implements. We have to arrive at an estimate of the weight indirectly, and are helped in this by the trade statistics of Germany. These report the weight as well as the value of all merchandise exported. As we are close competitors with Germany in neutral markets, exporting in large quantities even to the Fatherland, the basis of prices for comparison will not be considered uneven. The average value per metric ton of exports amounting to $39,200,000 is $117. Of these values machinery amounts to $26,000,000. This is of a total weight of 155,000 tons, equal to $160 per ton. Included in this sum are sewing machines to the amount of $2,750,000 (approximately equalling our own exports) at an average value of $217 per ton. The total of $39,000,000 averages only $117 per ton. If we accept $160 as the basis of value for our own exports we may claim to be rather underestimating than overestimating the tonnage. If we should still be considered as making too liberal an estimate we may point to the omission of not only the many millions in values of exports in highly finished manufactures, but of the heavy manufactures, like plows and other agricultural implements and parts, cars, etc., to make up for any allowance to be made in answer to criticism of this method of computation. The amount of the weight of the exports only, stated by value, would then stand in the following relations:

1890, dividing $21,851,000 by $160 = 136,000 tons = with allowance for waste, 164,000.

1897, dividing $48,800,000 by $160 = 305,000 tons = with allowance for waste, 366,000.

Which gives an excess of weight for 1897 of 202,000 tons.

As values were much higher in 1890 than in 1897, the excess figures, of course, would represent a larger residuary tonnage, as the tonnage of 1890 would become reduced if put on the basis of that year. The relative positions of 1890 and 1897 in the consumption of pig iron, based on the footing gained by the above trade facts, would be as follows:

	1890, tons.	1897, tons.
American product	9,202,000	9,652,000
Foreign product		...
Equal in pig iron to	900,000	200,000
Total consumption	10,102,000	9,852,000
Less exports (as per estimate above):		
Coarse products	52,000	674,000
Value products	164,000	366,000
Total exports	216,000	1,040,000
	9,886,000	8,812,000

Excess of consumption of pig iron in 1890 over 1897, 1,074,000.

It will be seen from this exhibit that in order to keep up to the rate of consumption of 1890 we should have required in 1897 a product of 1,074,000 tons more than the tonnage actually turned out, a product of 10,704,000, instead of the 9,652,000, the product of last year.

It is held that the maximum capacity of output has been reached in the present unprecedentedly large output. But it is likewise known on unassailable evidence from the best equipped producers in the country who produce their own ore, coal and coke at the lowest rate of labor cost known to the writer, with no profit in sight except that to afford the paying of the interest on their bonded debt, that the present rate of production is upheld only in the expectation of a very decided increase in the price of pig iron. Under the depressing influences at present at work, largely the result of their own inconsiderate commercial management, iron-makers would certainly soon be compelled to reduce production. But still the maximum product reached this year if maintained evenly through the twelvemonth would not give a greater total than 12,000,000 tons. Competent authorities state, however, that with the allowances that have to be made for all possible contingencies, 11,500,000 tons would be about the extent of production, unless a very much higher price could be realized, a price which would remunerate furnaces now out of blast on account of not being up to modern requirements. If that be the case there would then be available for home consumption in excess of the consumption of 1890, something like 800,000 tons, if the rate of exports of 1897 be maintained in 1898. The chances are, however, that it will be largely exceeded. The orders already booked for foreign account and the new ones reported almost daily, make this almost a certainty. It is apparent from all this that if allowance be made for the large increase in population and the great demand usually following a period of depression, terminated as this recent one was by a season of remarkably bountiful crops marketed at extra high prices, a pig iron famine would be much nearer the possibilities in America than in England, as foreshadowed in the article of the *Statist*. In Bessemer iron this stage is becoming visible on the horizon, although the increase in output since 1890 is entirely in this branch of iron, while the output in foundry iron has considerably diminished.

We can show the relative positions by stating the output of pig iron and Bessemer steel.

1890: Pig iron, 9,201,000 tons; steel, 4,277,000 tons; balance, 4,924,000 tons.
1897: Pig iron, 9,652,000 tons; steel, 6,114,000 tons; balance, 3,538,000 tons.
Estimate for 1898: Pig iron, 11,500,000 tons; steel, 8,000,000 tons; balance, 3,500,000 tons.

The proportionate reduction would be greater if allowance were made for waste in converting Bessemer iron into steel.

The change in the output of foundry iron and the increase in Bessemer iron is, of course, all found in the Northern States, Pennsylvania, Ohio, Illinois, etc. The Southern States are forced, by the nature of their ores, to keep to the production of foundry iron. They are not yet prepared for the making of any considerable amount of basic steel. But even here production is barely in excess of 1890 or 1892. The States of Alabama, Georgia, Kentucky, Tennessee and Virginia produced in 1890 1,467,000 tons; in 1892, 1,636,000 tons, and in 1897, 1,579,000 tons. In the week ending Feb. 1, 1898, with production driven to its maximum (whereby a rather feverish feeling was created in the market) the Southern output was not very much in excess of the average for 1897 or 1892. Reduced to weekly averages of a year of 52 weeks these States show the following output of pig iron:

	1890	1891	1892	1895	1897	Feb. 1. 1898
Alabama & Georgia,	16,267	16,250	17,788	17,100	18,537	19,700
Kentucky and Tenn.,	6,115	6,114	6,865	6,000	5,923	6,900
Virginia, ...	5,634	5,674	6,600	6,675	5,900	6,800

Import values of iron and steel and their manufactures:

	1880	1888	1890	1897
	Thousands of dollars.			
Iron and steel manufactures.....	71,266	48,992	41,679	13,835

Export values of iron and steel and their manufactures, and of articles of which iron and steel are the chief component materials:

	1880	1888	1890	1897
	Thousands of dollars.			
Iron and steel manufactures.....	14,716	17,763	25,542	62,737
Agric'l machinery, etc., and cars,	2,828	3,507	5,915	8,460
	17,544	21,270	31,457	71,197

The facts here introduced explain fully why with an apparently excessive production stocks are drawn upon, even in a time of the year when the demand is not yet at its height. The history of the iron trade of the last 30 years shows that the rate of production at the end of a decade was twice that ruling at its beginning. The sharp increase in output always took place close to the end of the decade. This is explained by the fact that our panics of 1873 and 1884 were followed by years of depression in which few new enterprises were started The demand was the more emphasized on that account, from the time the cloud became dissipated.

Production in 1880 was . . . . . 3,835,191 tons.
" " 1888 " . . . . . 6,489,738 "
" " 1890 " . . . . . 9,202,000 "

If we add to these figures the imports of iron (bulk and value, and computed into tons on a proper basis of value, which I do not wish to itemize, for briefness' sake), we have, for the same years, the following:

	1880.	1888.	1890.
Product, tons	3,835,191	6,489,738	9,202,000
Imports, "	1,788,938	1,433,536	900,000
" value equal to tons	50,000	50,000	
	5,674,129	7,973,274	10,102,000

Exports of iron and its coarser products did not exist in 1880 or 1888, and in the higher manufactures were not of sufficient moment to affect the result of this tabulation to any material extent. An allowance of 50,000 tons would probably provide amply for the omission.

With the additions by imports in the years 1880 and 1888, and speaking in round figures, we would then have consumed for strictly home purposes the equivalent of 5,600,000 tons of pig iron in 1880, 7,900,000 tons in 1888, and 9,900,000 tons in 1890. In 1888 the consumption was 2,300,000 tons more than in 1880 (a boom year in iron), while in 1897 it was about 1,100,000 tons less than in 1890. While 1890 shows an excess of consumption over 1880 of 4,300,000 tons, it has been shown that a production for 1898 of 11,500,000 tons does not leave more than 800,000 tons margin for home consumption over 1890.

The history of prices shows that changes take place very suddenly. Radical changes are apt to set in, when it is found that the facts have been misinterpreted, that scarcity rather than oversupply is in the cards.

The data here introduced make it easy for the reader to see that the facts point most strongly, for America, to an affirmative answer to the question raised by the *Statist*, "Will there be a pig iron famine?"

NEW YORK, April 10, 1898.

JONES & LAUGHLINS, Ltd., of Pittsburg, are making extensive changes in the yard arrangements of their plants. Laughlin & Co, Ltd., last week let a contract for new ore stock yards, and a contract has been let since for a complete rearranging of the Monongahela Connecting Railroad's yards. This road connects the plants of Jones & Laughlins on different sides of the Monongahela River. The stock yard will be located to the west of the Monongahela Connecting Railroad bridge and will have bins with a total capacity for iron ore 300,000 tons. This is more than double the capacity of the present furnace stock yard. A high rubble wall will extend 4,000 feet along Second ave. and for some distance south, and will contain about 30,000 cubic yards of stone. A "Y" will be built at the south end of the Monongahela Connecting Railroad bridge which will consume 3,500 cubic yards of bridge masonry in abutments, piers and pedestals. A plan is now under consideration for carrying hot metal direct in 15-ton ladles from the Eliza furnaces to the south side Bessemer plant.

THE managers of the Joint Traffic Association have made a rate of $1.50 per ton on scrap iron from Mansfield, O., to Allegheny, Bellaire, Buffalo, Bessemer, Pa., Braddock, Erie, McKeesport, Parkersburg, Pittsburg, Salamanca and Wheeling.

OBJECTION is made by the Carnegie Steel Co. before the county commissioners of Allegheny Co. to the valuation of $18,000,000 put on its property.

ELECTRO-METALLURGICAL MEMORANDA OF THE IRON INDUSTRY.

[Translation and comment for The Iron Trade Review by Dr. Richard Moldenke.]

Prof. Borchers, of Aix-la-Chapelle, delivered an interesting address at the recent annual meeting of the "Verein Deutscher Eisenhuettenleute," held at Dusseldorf. His subject, which might be described as the present status of the adaptation of electrical energy for metallurgical purposes, with special reference to the iron industry, is one which will doubtless eventually command attention on the part of far-seeing iron masters. While pig iron and steel have not yet been made commercially by this method, yet enough has been accomplished to demonstrate the flexibility of this wonderful form of energy, and its special adaptability for new lines of metallurgical research involving hitherto unsuspected transformations. The address of Dr. Borchers is given below in its entirety—though the translation is somewhat free—as its bearing may be far-reaching when the methods described are once thoroughly appreciated by our American students of industrial economy:

Even the layman will readily recognize two distinct types of electrical heating—that by means of an interposed resistance, as in the incandescent lamp, and the other by the direct one, as in the arc light. Both methods are made use of in the electric furnace, though each is capable of two further subdivisions. The method by interposing a resistance in one case makes use of the object to be heated as the resistance. In the Thomson electric welding process the joint forms the resistance, this occurring from the fact that the reduced area of the ends to be welded and the comparatively poor contact of the molecules, form a spot of poorer conductivity in the otherwise normal circuit. The speaker shows several types of electric furnaces made use of by him for many years. One of them in use 10 years, in which the substances are heated by contact with an electrically heated resistance such as incandescent carbon, had demonstrated back as far as 1888 the reducibility of all the oxides at that time considered beyond the influence of scientific methods. This case forms the second division of the methods of heating by means of an interposed resistance. Among the furnaces we have the one of De Laval, in which an iron sponge was to be obtained and purified by the action of a bath of magnesite melted with the electric current.

In heating with the electric arc we have what may be termed direct and indirect heating. In the first case the substance to be heated replaces one of the carbons of the arc light. Typical of this method are the furnaces of Siemens in 1878, the Bernardos method of soldering, Slavianoff's method of patching castings, and many of the recent carbide of calcium furnaces. Provision must be made in the case of materials which are non-conductors that the proper arc is formed in a suitable way, as for instance by introducing them into chambers heated with independent arc lights. W. Siemens realized this, and patented his discovery in 1879, in England, also specifying the use of an electro-magnet to deflect the arc into the desired position. It may therefore be said that he practically fixed the standard requirements of electric furnaces. The later furnaces of Moissan, Chaplet, Ducretet, and Lejeune, are really modifications of the Siemens furnace. Tevener's electrical soldering device may be mentioned here incidentally, being sufficiently well-known to the technical portion of iron trade circles.

Let us, then, investigate the electric furnace of whatever construction it may be, to see what advantages are offered us. Granting the correctness of Joule's law, it becomes a possibility to develop any required amount of heat, at any desired temperature, in a given minimum space. In accordance with this law the amount of heat developed in a conductor equals $0.24\ J^2\ W\ S$, in which J is equal to the number of amperes, W the resistance in ohms, and S the time in seconds. The larger we make W, or with W constant, if we increase J, the greater will be the amount of heat contained in a given space. Thus heat is also developed in the regular circuits for ordinary lighting, but the relation between this heat, and the conductivity of the wire and that of the surrounding atmosphere is such that the temperature of the conductor remains practically constant. If we magnify this relation we would theoretically be able to obtain infinitely high temperatures, but are limited by the practical effect of the volatilization of the carbon electrodes at about 6,300° F.

The melting of carbon has often been disputed, but I show you herewith two carbon rods which had softened enough to become wavy in a few seconds with a current passing through them corresponding to only 6,000 amperes per square inch. From this it will be seen that if the heat can be imparted to the carbon fast enough, it is possible to melt it under ordinary pressures. It also shows that in heating with interposed resistance it is possible to obtain the melting and volatilization of carbon just as with the direct arc light. This will answer our present purposes very well, as it gives us 6,300° F. to work with, while the best results obtained so far in the direct firing of furnaces have only reached 3,600° F.

However, such high temperatures as 6,300° F. are not necessary for even the most refractory of oxides. Since with currents of 6,000 to 9,000 amperes per square inch of cross section of the electrode the volatilization of carbon is already effected in the electric arc, while with 300 to 600 amperes a temperature of only 900° to 1,100° F. is reached, it will be clear that the 3,000 amperes per square inch necessary to reduce lime and produce calcium carbide is accompanied with a temperature far below 6,300° F. We need not therefore fear the insufficiency of the temperatures obtained in the electric furnace, but rather the unnecessary waste of current in producing given results.

A comparison of the direct arc with the resistance furnaces gives us the following: In the furnaces having resistances any desired temperatures up to 6,300° F. may be obtained. In those using the electric arc this high temperature always exists. Furthermore, the distribution of heat throughout a large mass is much better effected by means of resistance heating than by the direct arc method. By mixing with dielectric substances, any desired resistance can be given to the material for heating purposes. With a given current the cross section of the material can be adjusted to suit the requirements very easily. Another method is to introduce a number of resistances in a non-conducting mass and thus bring it up to the desired temperature almost instantaneously.

In the electric arc methods such a number of heat centers may also be produced. The arcs may be thrown directly upon the melt, if desired, or be kept far enough away from it to produce any desired effect of temperature. But in this case the temperature is always one reduced from 6,300° F., as for instance in making calcium carbide where about 4,500° F. is wanted. In any case the direct arc will always be used in electric furnaces if in the resulting reactions substances are formed which influence the resistance of the charge to such an extent that a close regulation of the process becomes impossible.

Another advantage of the electric furnace which should not be underrated is its adaptability for working with any kind of an atmosphere, and under any practical pressure. In the regular methods of firing we have to deal with the influences due to the constituents of the air admitted, the fuel, and the products of combustion. Moreover, the same refractory material is used for electric furnaces, and others heretofore unused have been made available.

Let us look at the products of aluminum. In the '50's we already knew exactly how to separate aluminum from its salts. Nearly all the conditions were clearly defined by Bunsen and St. Claire-Deville. We knew that the metal could be obtained by the electrolysis of dehydrated salts of aluminum, and that the separating metal could be replaced by the addition of aluminum oxide. But unfortunately we did not know of any crucible which could endure the reactions going on in separating the metal from its chlorides, fluorides, etc., and at the same time allow the imparting of heat to the interior of the charge from external sources. The moment Hérault, however, made use of the electric current, and thus made the center of the charge the striking point of the operation, the condition of things were reversed. This instance alone will show how an industry was suddenly developed, the fundamental principles of which were known to metallurgists for over 40 years.

In spite of the high temperatures dealt with, it is unnecessary to resort to other refractory materials than those now made use of, for by means of suitable arrangements for cooling externally, the lining of the furnaces can be kept sufficiently rigid. Even the carbon electrodes can be kept cool enough to prevent a reaction with the melt.

The rapidity of the operation often has a deciding influence

upon the success or failure of a new method. Thus the speaker successfully reduced liquid molybdic acid with carbon in the electric furnace with but little loss. A similar trial in the regular crucible furnace would result in the volatilization of all the molybdic acid before the temperature necessary for the reduction would have been reached in the centre of the charge.

The flexibility of the electric furnace is such that every problem in the technology of firing may be solved, since there are available all the separating materials to be desired, pressures and temperatures of all kinds and conditions of surrounding gases during the operation not attainable elsewhere. Steel may be melted in a cornucopia of paper without singeing it.

The next point of interest will be to study the applications of the electric furnace to the demands of industrial requirements on a large scale. The aluminum industry has already solved a part of the question. The speaker has even devised an electrical blast furnace which he does not, however, recommend for use commercially. The electric furnace for making carborundum is an excellent example of heating on a commercial scale by means of introducing resistances. The objection which may be made is that the process is not continuous. However, a battery of these furnaces can be made to act practically continuous so far as the product is concerned, just as would be the case with a battery of converters.

The electric furnace making use of the arc light with the substance itself as one of the electrodes, has been practically developed by the carbide industry. If it is desired to adapt this system to the blast furnace, and in such a manner that the waste heat is utilized above, it will become necessary to place the electrodes in special flues running into the base of the shaft. This method should also be adopted where the arc itself is used for heating.

Now, what immediate use has the electric furnace in the iron industry? The utility of the present time is an indirect one. The extended use of aluminum in steel works is well known, as also the increasing consumption of chromium, tungsten, and molybdium. These metals are now being furnished at a much smaller cost than formerly. Especially chromium and tungsten, which while easily made formerly, were never pure, being contaminated by carbon. Moissan succeeded in taking the common chrome metal made by an ingenious adaptation of the Martin process, and purified it by remelting it with chromium oxide, or chromide of lime in the electric furnace. In this way he removed all the carbon. The electric furnace is simply indispensable in this process, for chromium shows no sign of sintering together in the hottest open hearth furnace of the most advanced type. A similar experience resulted from tests made on a patented process for reducing chromium oxide with sulphide of antimony. This reducing agent was later on replaced by sulphide of iron, giving a ferro-chrome, but the result in both cases was a regulus free from carbon.

Less attention has been paid to the production of tungsten, for this is easily reduced from its oxide and can be sintered together, if desired, in the crucible furnace. As it is usually demanded in the form of a powder, the ordinary way may still be used successfully. Molybdenum can be made very simply by heating molybdenite (sulphide of molybdenum) in the electric furnace. It splits up into molybdenum and sulphur. Unfortunately the supply of molybdenum is limited.

Calcium carbide has not fulfilled the expectations developed at the time of its discovery, so far as its use in the iron industry is concerned, yet it has been an indirect benefit to it in its way. The carbide of silicon, called carborundum by its inventor, seems to justify greater hopes for ultimate use in replacing ferro-silicon. It must first come down in price, however. In fact, there will probably be soon a rival in the field in the shape of an extremely rich ferro-silicon, made by the reaction of sand and sulphide of iron. Whether this invention will pour out well or not is still to be demonstrated, but the electric furnace without doubt is destined to shake some of our theories of reactions at high temperatures.

The speaker would recommed sulphide of iron as an extremely valuable material for making the ferro-alloys, even where they contain zinc, for the zinc may be recovered in the shape of zinc white.

In the laboratory itself the electric furnace gives us a remarkably wide range in experimenting. Much as has been discovered in the line of combinations of the non-metallic with the metallic elements, there is still a vast field to explore, and doubtless many a surprise awaits the investigator. The study of the processes going on in the blast-furnace, in puddling, tempering, annealing, case-hardening, etc., will doubtless be aided greatly. Then again, the electric furnace is the only one allowing iron to be brought up to any temperature desired, without absorbing impurities, let us study the behavior of each simple alloy of iron with other elements, and ultimately will answer many a question which is now only partially covered by a very vague hypothesis.

New Chicago Foundry Firm.

The William Ferguson Foundry Co., of Chicago, whose incorporation, with a capital stock of $25,000, was mentioned in these columns recently, has taken a lease of the plant of the old Chicago Iron Works, at Hawthorne and Willow sts., Chicago, and is fitting it up as a first-class foundry in every respect. The main building of the plant, 80 x 150 feet, will be used as the foundry floor, and will be supplied with a cupola of daily capacity of 40 tons, and two 10-ton compressed air traveling cranes. With the growth of the business further cupola capacity will be added. Castings as large as 30 tons in size can be made with the present equipment. Track facilities for handling the product of the foundry are provided, entering the main building. An annex 40 by 100 feet will contain the core ovens, core rooms and pattern shop. Two core ovens are provided, one 10 x 12 x 20 and one 8 x 8 x 20. Further equipment will be added as the business justifies.

A special feature will be the casting of gears of 24 inches in size, and over, and pulleys and fly-wheels of all sizes, without the use of patterns, thus making a considerable saving in the cost.

The president of the company, William Ferguson, is one of the best known foundrymen in the West. He was for several years with Fraser & Chalmers as superintendent of the foundry department, and for the past four years occupied a similar position with the Gates Iron Works. Mr. Ferguson for a long time has been a prominent member of the Western Foundrymen's Association, and is vice-president of that organization. His reputation as a progressive foundryman is widespread, and will be of considerable benefit to the new company. Paul M. Lange, a successful business man of Chicago, is secretary and treasurer of the company.

In the seven weeks preceding April 10 more than 100 solid trains of steel rails were shipped from the Illinois Steel Co.'s works, having Japan as their destination. A steamer sailing last week from Mobile for Kobe, Japan, carried 2,200 tons of the rails. Other shipments have been made from Atlantic, Gulf, and Pacific Coast points. The great bulk of the original order for 50,000 tons given by the Japanese government to the Illinois Steel Co. has gone forward.

Some excellent records for production are being made in the Bessemer and basic open-hearth steel plants of Jones & Laughlins, Ltd., at Pittsburg. The March total was 49,060 tons of Bessemer and basic billets. At the open-hearth plant, No. 6 furnace recently made 17 heats in one week, the output being 612 tons. Some improvements in the Bessemer plant will further increase. In a short time blooms will be cast on buggies, besides other improvements to equipment. Hot metal will be brought from Eliza furnaces on the north side of the Monongahela River to the Bessemer steel plant on the south side by way of Monongahela connecting bridge.

Connellsville coke production has remained in the neighborhood of 150,000 tons a week for some time. In the week ending April 9 the estimated output was 155,998 tons, against 156,814 tons in the preceding week. The tendency to curtailment of pig iron output in the valleys may result in some lessening of coke operations. Cars have been by no means plentiful in the Connellsville district.

American Pig Iron Storage Warrant Co. stocks April 10 were 279,500 tons, 1,600 tons having been put in yard and 5,300 tons withdrawn in the preceding 10 days.

45-TON LADLES FOR HOMESTEAD.

The half-tone illustration below gives a view of four 45-ton ladles, as completed, ready for shipment at the Pittsburg plant of the Riter-Conley Co. They are part of an order of twenty-four 25-ton, two 40-ton and eleven 45-ton ladles for the Duquesne and Homestead Steel Works of the Carnegie Steel Co., Ltd. Fig 2, for which we are indebted to the *Engineering News*, gives some of the details of construction. The shells and bottoms are of flange steel and the riveting is done under a pressure of 60 tons. The shrinking of the bands upon the shells is accomplished by much the same procedure as in the shrinking of hoops on a built-up gun. The trunnions are steel castings, machined and drilled for the connections with the shell. The 45-ton ladles, of which four are shown, are for the Homestead Steel Works, and the 25-ton ladles, of the same order, for the Duquesne plant.

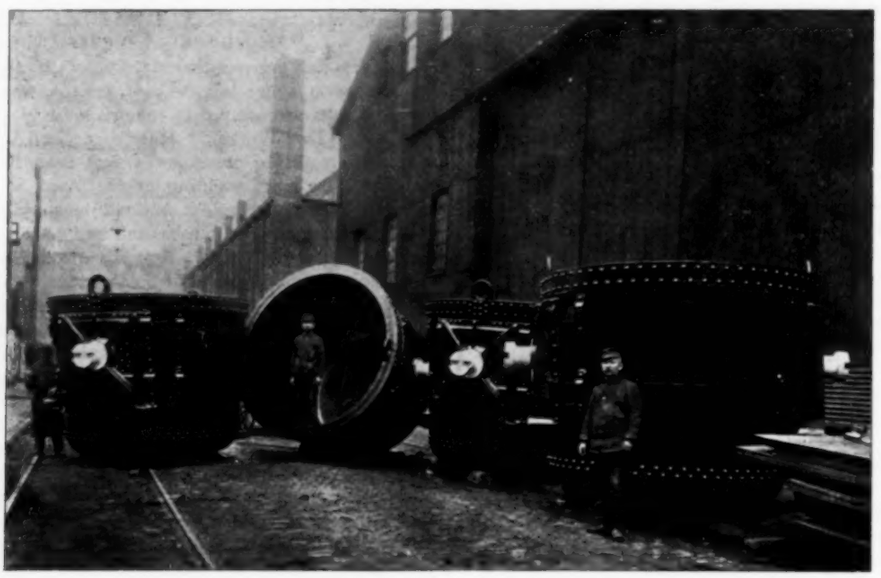


FIG. 1.—SHIPMENT OF 45-TON LADLES FOR HOMESTEAD STEEL WORKS.

The structural plant of the Riter-Conley Co. is located in Allegheny. The boiler and plate working plant is in Pittsburg. About 600 men are employed at the two, and the equipment includes some powerful tools—presses, riveters, punches, flanging and bending rolls.

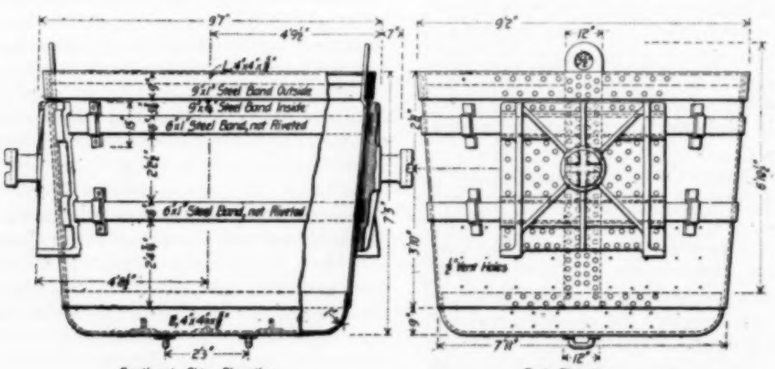


FIG. 2.—DETAILS OF 45-TON LADLES FOR HOMESTEAD STEEL WORKS.

New Galvanizing Company.

The Duquesne Galvanizing Co., recently organized at Pittsburg, has secured the plant formerly occupied by the Roberts Chain Belting Co. at 21st and Smallman sts., Pittsburg, and is equipping it with new machinery throughout. The company owns patents covering a method of electro galvanizing which they are going to use exclusively. The merits of the process are in the solution, which requires no spelter except that supplied by the zinc and other ingredients. Herein consists the economy of the process. The chief merit of sheets treated by the method is an unusual smoothness of surface. The solution is absorbed rather than coated on, and in a number of rigid bending and doubling tests the galvanized surface has shown no cracks or even roughness. The company is capitalized at $25,000 and the officers are: F. K. McCance, president; J. D. Hailman, vice-president; W. T. McCance, secretary and treasurer, and R. O. Miller, manager. The officers are all residents of Pittsburg.

THE Panama manganese mine, says the San Francisco *Chronicle*, is a valuable deposit of this mineral opened up within the last two years by Baltimore capitalists. The mine is situated on the Atlantic coast of the U. S. of Colombia, about 40 miles north of Colon. It is worked by a company with $200,000 capital, in which the chief stockholders are Mr. John K. Cowen, of the B. & O. Railway Co.; Mr. F. W. Wood, president of the Maryland Steel Co., and Mr. Henry Parr, of Baltimore. It is easily mined, and is carried by a cableway to the foot of the mountains and by nine miles of railway to the shipping port of Nombre de Dios. Within the last 18 months the company is said to have shipped 24,000 tons to the United States. According to the *Chronicle*, the cost is about $4 per ton landed in Baltimore, where it is worth from $14 to $15 per ton, according to quality. Mr. E. B. Williams, of Connecticut, is in charge of the mines and employs about 300 men.

THE traveling and district freight agents say that in the last 12 months more fire brick, fire clay and structural iron and steel for manufacturing plants have been shipped into New Castle, Pa., than have been sent to any other city in the United States.

BRISTOL Furnace, Bristol, Tenn., will start up May 15.

Review of the Technical Press.

[Translations, Condensation and Comment expressly for The Iron Trade Review by Dr. Richard Moldenke.]

The Coffin Toughening Process. [*Proceedings Western Railway Club*, February 25.] Mr. S. R. Pomeroy, of the Cambria Iron Co., compares the effect of this process upon steel to the chilling of the tread of a cast iron car wheel, or the tempering of a spring. Not being a part of the steel-making process itself, it may be called a form of manipulation applied afterward, producing a harder structure than is given by annealing, and yet not so hard as brought about by tempering. Since a forging upon leaving the hammer is full of internal strains so varying in character that failure sometimes takes place quite unexpectedly. Annealing is therefore resorted to as the best means for restoring the material to its original state. This, while perfectly satisfactory in that regard, goes too far, as it takes away the stiffness gained by forging. Tempering, Mr. Pomeroy states, has the tendency to produce a structure which is hard and brittle. The chemical composition of steel, taken in connection with the heat treatment it receives, is now gone into and explained with the aid of microphotographs, the effect of bringing steel up to varying degrees of high heat, either slowly or quickly, and similarly cooling it slowly or quickly, being shown. An experiment is recorded in which three pieces were cut from one bar, the first piece, representing the original material, was nicked on the under side and supported at the end upon knife edges. One sharp blow by the smith was sufficient to break it. The second piece was heated slowly to a light cherry red and slowly cooled. Upon being treated like the first one it took five blows to break it. The third piece was heated like the second, but quenched to a point showing a dull red in the dark, and then removed from the water and allowed to cool in the air. This specimen required a blow from the steam hammer to break it. Unfortunately the exact temperatures are not given, though they could easily have been obtained with the aid of the Le Chatelier pyrometer. The Coffin process takes the forged axles after cooling, heats them up to a temperature slightly above the point of recalescence, which take a little over one hour, then cools them rapidly to a very low red heat by dipping into water automatically, the axles being made to revolve rapidly while submerged streams of water play upon them. In a few seconds the cradle is raised and the axles are rolled on the cooling bed. The interior heat still remaining brings the whole mass to a dark red heat. The claim is made that the effect of this method of treating steel raises the elastic limit while leaving the ultimate strength, elongation, etc., the same. An axle being cut in two and one-half treated by this process, showed an increase of 46.6 per cent in the elastic limit. This means that the safe margin for service in which the metal is subjected to violent blows and shocks is considerably increased. A series of observations on broken axles is now given, also the results of tests on the comparative wear of the surface of 1-inch cubes cut from the wheel seat part of the axles and near the surface. The conclusion derived from these tests are that the open-hearth treated axles have the best wearing qualities; next come the untreated ones, and then the Bessemer and the wrought iron axles. In the discussion which followed Mr. Pomeroy explained the advantages of the process more fully, giving a number of diagrams to support his claims as against those of the tempering processes. The above paper and that of Mr. Porter on nickel steel for crank pins and axles being discussed at the same meeting, brought out a number of interesting points regarding the gradual substitution of steel for wrought iron in railroad practice.

Utilization of Blast Furnace Gases for Power Purposes.—*Stahl und Eisen*, March 15, has the official report and discussion on the above subject. Mr. F. Luehrmann had been asked to study the bearings of this important question and report his conclusions to the "Verein Deutscher Eisenhuettenleute." In taking up the utilization of blast furnace gases, Mr. Luehrmann very properly aims to give both the advantages and disadvantages to be considered. The more optimistic representations of the technical press have unfortunately been too liberal with the net profits supposed to result from the extended use of blast furnace gases in the gas engine, one journal even making the claim of saving as much as $3.26 per ton of pig iron. On the other hand, if the application could be made as indicated, the steam plant would be done away with, and practically double the power be made available. An interesting description of the rise and development of the gas engine, which is really a heat engine, is not given, a rather odd but true statement being that the oldest known heat engine is the cannon. A detailed review of this part of the paper seems unnecessary, further than to note comparative efficiencies. Blast furnace gases contain about 24 to 34 per cent of combustible constituents. There are, however, a number of difficulties met with in utilizing them, and among these are the following: The varying character of the gases. This comes from changes of burden, the manner of running, and the behavior of the furnace itself. While the gases may be analyzed, and their constituents even predicted from time to time, account must be taken of more serious variations in composition than is the case with illuminating or producer gas. The running records obtained from actual installations, however, seem to indicate that this may not turn out to be so serious as it looks. The comparatively poor quality of the gases is the second difficulty encountered. Gases in which there are great quantities of non-combustible constituents are hard to explode, burning slowly and incompletely. This point alone will retard the application of gas engines on a large scale until the problem is better understood. To get over the difficulties due to poor ignition, compression, and firing with an electric spark is resorted to. While illuminating gas is compressed up to 60 lbs., producer gas requires 100 lbs., and the blast furnace gases may even require 130 lbs. per square inch. Next comes the dust problem, and this is really the most serious. There may be said to be two kinds of dust existing in blast furnace gases. First comes the dust blown out of the charges as they pass through the bell of the stack. This dust settles very quickly and can be taken care of easily. Then we have the dust coming from the zone of reduction in the blast furnace, and this is carried through the flues, under the boilers, through the stoves, finally escaping from the chimney in the shape of a white smoke, often traveling nearly one-third of a mile. Many of the compounds formed in the blast furnace are in the shape of vapors, orare so finely divided that they become pyrophoric and burn when coming in contact with the air. On the question of the nature of this dust, the opinions of various blast furnace managers are given, and form very interesting reading indeed. The conclusions derived have a direct bearing upon the question of cleaning the gases, and seem to indicate that extraordinary precautions are to be taken in this regard, the processes necessary being first dry, and then wet ones. In scrubbing the gases all the water vapor in them condenses, which means an ultimate saving in spite of the cooling. Various methods of cleaning are now described, and their efficiency illustrated by analyses before and after use. The question of capacity on the part of gas engines is now taken up, the doubt being expressed whether they can be made large enough to replace the steam engines now in use. The solution of this part of the problem does not seem so very difficult, and possibly it is better economy to stick to lower power units, and more of them, thus deriving the advantage of greater uniformity of working. The suggestion is made to look into the merits of electrical transmission of large units by combination with gas engines, as these utilize 23 per cent of the available heat units, while the steam engine only takes care of 12 per cent at the best. The conclusions derived by Mr. Luehrmann are that for the present it is best to await developments, for were all blast furnaces to order gas engines corresponding to their capacity in waste gases, the existing gas engine works would be occupied for 12½ years alone. A series of elaborate tables accompany this report, giving calculations, analyses, etc., of waste gases, dust, and also other interesting data. A number of blast furnace managers took part in the discussion, considerable amusement being created by one of the members, who has an installation of such gas engines at his plant, cordially agreeing with the speaker as to going slow, he having no objections to benefiting by the advantage derived therefrom. Another member mentions the fact that there would be no difficulty in obtaining large gas engines, and with a given demand, the steam engine builders would gladly go into this business also. Again it was possible to clean blast furnace gases by just simply storing them to let the hurtful dust settle. A calculation of the relative efficiencies of blast furnace gases and illuminating gas, shows that the engine for the former would need to be twice as large as that for the latter. This was disputed by Mr. Korping, the well-known gas engine builder, who maintained that this discrepancy can be overcome in other ways. The figures given by Mr. Luehrmann were criticized and discussed at length. Several of the members then described plants which are in successful operation, and pointed out that the mechanical difficulties encountered here are no greater than in other kinds of installations. Mr. Luehrmann answered the various critics, and regretted that there were not more of them, so that further important points relative to the question of utilizing blast furnace gases for power purposes could be brought out.

SPECIFICATIONS FOR MALLEABLES.*—I.

BY C. L. SULLIVAN.

In 1895, Mr. R. H. Stanford, C. E., began a paper before the American Society of Civil Engineers, by saying that: "If any systematic and scientific study has been made of malleable cast iron the results have been very carefully kept quiet." The writer re-discovered this fact, when he began the work of preparing this paper. He has not been able to find any real specifications for malleable iron castings. Mr. Stanford's very excellent address covered principally the manufacture of malleable castings, the kinds of pig and scrap required to make a good product, the effects of changes in the method of mixing, melting, and pouring, the process of annealing, the original and final chemical proportions, and some figures of physical tests. It is intended here to omit all these items and to present information to guide users of this material in procuring good malleable iron castings, a long search having failed to discover any complete information of this kind.

From one or two quarters objections have been made to publishing information of this kind, the objectors claiming that the manufacture of malleable castings is a trade secret which should be kept sacred. The writer disagrees with the objectors, and believes that they are mistaken in claiming that there are at this day any secrets in the manufacture of malleable castings from the very poorest to the very best, and how reasonable specifications can hurt responsible manufacturers is beyond comprehension. It is not intended to put forth requirements so rigid that no one can attain to them, but to ask for such qualities as will bar out bad materials and workmanship and thus protect legitimate manufacturers and purchasers alike. Certainly purchasers need some protection, if we can judge by the character of some of the stuff that they have bought and paid for as malleable castings. To illustrate, it is far better to use a center plate weighing 120 pounds in good gray iron at a cent and a half a pound than to use one weighing 50 pounds in make-believe malleable iron at any price. The first may carry the load, the second is certain to break because the material is probably no better than the gray iron, and there is not enough of it for requisite strength.

The rapid growth of the use of malleable iron castings in car and locomotive construction has been brought about principally through constant and material reductions in their selling cost, the former great difference in cost between gray and malleable iron castings having largely disappeared. There is still an averge difference of about one and one-quarter cents per pound between gray and malleable iron, but this difference quite disappears in the net costs, a malleable casting of a given pattern weighing sometimes 60 per cent less than the corresponding gray iron casting. This great slump in malleable iron prices has benefited the purchasers at the expense of the manufacturers. It is true that increased and improved facilities have cheapened the cost of production, and the stronger companies have been able to buy raw materials at lower prices. But there is a danger now that purchasers will be made to suffer unless they protect themselves by rigid requirements as to quality.

It is admitted by conservative manufacturers that profits have been scaled down so low that but little more can be done in that direction without sacrificing all profit. No further advantage is possible in the purchase of raw materials. The cost of selling is increasing, which is due to competition; wages can go no lower, and there seems but little to be gained in the direction of improved foundry facilities. So the danger hinted at is that advantage will be taken of sacrificing the quality of the material, of turning out carelessly molded and carelessly and insufficiently cleaned and annealed castings. Good malleable castings never have been and never will be produced as cheaply as gray iron castings. If competition and the demands of purchasers hammer the price down lower than that for which good malleable castings can be produced purchasers will suffer by receiving material of inferior quality, castings not sufficiently close to patterns and which are insufficiently cleaned. It is obvious that manufacturers must realize some profit in order to remain permanently in the business. One way to check the downward tendency of prices and thus save the quality is for purchasers to buy under rigid specifications. And why not? Almost everything else that is bought by a railroad company is bought under specifications. There would scarcely have been a bottom to prices, and perhaps scarcely a bottom to the quality of materials, if it had not been for the specifications under which they have for a number of years been bought.

Malleable iron foundries are multiplying rapidly, and while the demand for this material is increasing, the capacity to supply is undoubtedly growing faster than the demand. In the hot competition now existing purchasers are getting the benefit of constantly lowering prices. This, as has been said, is well enough while it is not accompanied by a deterioration in the quality of the castings. Conscientious founders will maintain the quality, and probably fail for the want of profits rather than sacrifice their reputation for good goods. Others may try to save themselves by "skinning" in the quality of their work, and their customers may also be subjected to this process. The result of this will be a check to the use of malleable castings. The writer suggests that much trouble may be saved to both manufacturers and users by working to specifications. This course would fix the bottom prices at which it would be profitable to sell or buy malleable castings.

There is no dispute now that it is profitable to users to pay an additional cent or more per pound for malleable castings than the prices for which the best gray iron castings can be bought. The reasons need not be mentioned here, as they are generally recognized; but unless the quality is maintained there is no advantage in maintaining the substitution.

The scope of the specifications should be about the same as for gray iron, wrought iron or steel, except that it would be useless to have the chemical tests. There is a good deal of material on the market called malleable iron that is but little if any better than gray iron. The competition of this mongrel material hurts customers and conscientious manufacturers as well. As "all that glitters is not gold," neither is all that is called malleable iron genuine; and the good and the indifferent or poor should be separated by intelligent specifications.

We all have heard of a few instances of purchasers requiring malleable castings to meet requirements as to strength, but they were in special cases, such as in guaranty bonds, relief from consequential damages in case of breakages of castings, when castings were sold by brokers, the broker desiring protection against both the manufacturer and the purchaser. There being no standard of strength by which to be governed the requirements were not very rigid, being a compromise between good gray iron and the known minimum of strength for malleable iron. These requirements were better than none, even if tensile strength only was specified. They barred out bad and indifferent material, and gave both manufacturer and purchaser protection from material known to be malleable iron only by its stamp.

In the making of good gray iron castings there is a greater latitude in the selection of pig and scrap, and of mixtures, than in making malleable iron castings. In making malleable iron castings greater care is necessary in melting, molding, and rapping. As they contract in cooling after molding nearly one-fourth inch in one foot, and as they expand in annealing one-eighth inch in one foot, two movements are given to the molecules of iron, and this must be taken into consideration all through the process of manufacture, from the selection of the different kinds and grades of pig and scrap, through the mixtures, melting, molding, packing, and annealing; and particular care is required in making patterns to distribute the metal in as nearly as possible uniform masses. All abrupt changes in shape should be "eased" with fillets. In cleaning by tumbling, or otherwise, greater care is required than with gray iron castings, because the heat of annealing "burns on" any sand not removed in cleaning. This is a serious matter if the castings are intended to fit over other parts and in castings which must be galvanized, because the zinc does not deposit upon the sand. Pickling does not always remove the "burnt on" sand. As dependence is placed not altogether, but largely, upon the "skin" of malleable castings, the cross section at any point should be such as to give as much outside surface as possible. This can be accomplished by cutting thick portions up into ribs and by coring out the inside of large sections. Notwithstanding that a given section of malleable iron is from 30 to 60 per cent stronger than any equal section of gray iron, because of the comparatively very much reduced section of malleable iron, the metal should be free of blow holes, and the surface should be free of irregularities.

*Western Railway Club, March Meeting, 1897.

NEW UNIVERSAL MILLING MACHINE.

The accompanying illustration shows a new No. 1½ universal milling machine which has been brought out recently by the Davis & Egan Machine Tool Co., of Cincinnati. The frame is cast in one piece, including the uprights, which are bored to receive the spindle boxes and overhanging arm. The inside of the frame is fitted to hold tools and attachments required about the machine.

The spindle is made of crucible steel and runs in phosphor-bronze boxes, provided with means for taking up the wear. It has a ⅝ hole its entire length, the front end being bored for No. 10 B. & S. taper. The driving cone has four steps, the largest 12 inches in diameter, for 2½-inch belt, and is powerfully back-geared. The overhanging arm is 3¼ inches in diameter and is so made that it can be turned out of the way or removed.

The table is 37 inches long, 6½ inches wide, and has a working surface of 34 x 5⅛ inches. The length feed of the table is 20 inches, automatic in either direction. It can be reversed by a handle without reversing the motion of the spindle, and is tripped automatically or by hand in either direction. The screw operating the length feed is provided with a device for taking up the wear.

Automatic cross and vertical feeds can also be had on this machine. The power cross feed is desirable for rack cutting, vertical milling, etc. The vertical feed is convenient for sawing, drilling, reaming, and milling. It is automatic either up or down, and is tripped automatically in either direction. The variable feed gives 15 distinct changes of feed to each spindle speed, and is obtained by a simple mechanism at the back end of the spindle. Throwing this lever from one extreme to the other more than doubles the rate of feed.

The spiral head and tailstock centers swing 10 inches in diameter and take 17½ inches in length. The head can be set at any angle from 10 degrees below the horizontal to the perpendicular. The front end of the spindle is threaded and has a No. 10 B. & S. taper hole. The straight hole through spindle at end of taper is 1 1/16 inch in diameter. By means of the angle plate the head can be set at any angle on the table. An automatic rotary pump supplies the cutting tools with lubricant, which is caught in pans below. The vise is graduated at its base and can be swiveled to any angle. The jaws are ⅝ inch wide, 1⅛ inch deep, and will open 2¼ inches. The countershaft has friction pulleys 12 inches in diameter for 3½-inch belt, and should run 140 revolutions per minute.

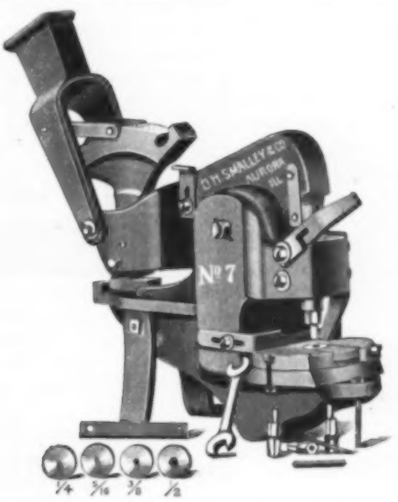
Each machine is furnished with one 6-inch three-jaw universal chuck, change gears, index plates, arbor, angle plate swivel vise, wrenches and overhead works.

THE Elkhart (Ind.) Iron Works Co., incorporated with a capital of $16,000.

AURORA PUNCHING MACHINE.

Several features of the Aurora punching machine, No. 7, illustrated herewith, are worthy of mention: Strength and solidity are provided in the parts of the main frame about the throat, holding the dies, strippers and the plunger which carries the punches. All are embraced in a single strong casting. The guide is very long and the plunger is accurately fitted, and gibbed, to prevent rotary motion. No vibration or change of position is possible, and square or irregular shaped punches and dies may be used with no greater danger of injury than with ordinary round punches and dies.

The die-block, once securely bolted to the bed of the machine, need not be loosened or readjusted for setting any dies. The greatest cutting diameter is not over one inch. All punches and dies are self-centering and changes from one size to another need not require more than a minute. Improved chucks, holding all punches up to one inch diameter, make possible the use of double-end punches of straight drill-rod up to 1⅛ inch diameter. Punches furnished by the manufacturers are either flat faced or with center point, both ends alike and reversible, making two punches in one. The opening in the bed is 2¾ inches square, permitting the use of the machine for cutting or forming material up to that diameter. A false bed-piece may be attached, in place of the die-block, carrying suitable shearing blades for cutting angle iron, bar or sheet metals.



These machines are made by D. H. Smalley & Co., Aurora, Ill., who will furnish further details.

NOTWITHSTANDING the fact that the Bethlehem Iron Co., South Bethlehem, Pa., has on its books large orders for finished guns of various calibers up to 12 inches, gun carriages and forgings for guns which are to be completed at the various Government yards, the number of orders it is taking for merchant work, such as shafting of various descriptions, both solid and hollow, and of plain steel as well as nickel steel, is increasing daily. The products of this concern have a world-wide reputation, as instanced in the taking of several contracts for armor plate for the Russian Government. Last week the company was asked to quote a price on shafting for a torpedo boat which is being built in Japan. It is the only firm in this country that was asked to compete with such well-known works as Vickers Sons & Co., England; Krupp, of Germany, and Schneider & Co., of France.

MACHINERY orders from Germany have not fallen off since war prospects have increased. The New York *Journal of Commerce* notes the placing of a $22,000 order one day last week with one house for shipment to Hamburg. There is some shrinkage in machinery business with England, but no difference in other European quarters. Some unusual orders from Germany have been noted lately.

THE American Steel Casting Co., of Sharon, Pa., is making 20 large anchors of 4,000 pounds each, to be shipped to South Africa. The plant is operating full time.

THE TIN PLATE MARKET.

Complete stagnation continues in this line and there is no quotable change in the market. Spot stocks are firmly held. Some concessions have been offered by large mills to buyers who might place contracts over the last half of the year; but it is doubtful if concessions offered have brought about any volume of actual business. The trading has been from hand to mouth, and the buyers, through the West at least, are interested only in receiving their plates on contracts made some time ago. Many mills are slow in making deliveries. It is generally conceded they are all well supplied with orders up to and including July, but this condition, which ought to bring about a much stronger market has had, as yet, no effect whatever.

It is impossible to predict the course of the market in case of war. There is a disposition on the part of many sellers to scrutinize credits much more closely than in ordinary times.

There is no quotable change in the market, which we give, as follows:

CHARCOAL TINS.

	IC	IX
Calland Grade, tissue packed,	$4.00	$5.00
Allaway Grade,	3.40	4.30

COKE TINS.

IC, 108 lb.	Basis weight,	$2.85
100 lb.	" "	2.75
95 lb.	" "	2.70
90 lb.	" "	2.65
85 lb.	" "	2.60
80 lb.	" "	2.55

WORCESTER GRADE TERNES.

IC, 216 lb., 20 x 28		$5.80
200 lb.	"	5.50
190 lb.	"	5.40

For deliveries April, May and June, 5c to 7½c higher than prices mentioned above.

GENERAL offices for the Cleveland district plants of the American Steel & Wire Co. were opened in the American Trust Building, Cleveland, April 18. Stewart H. Chisholm, second vice-president of the company, has charge of the district. G. H. Schuler, who was formerly manager of the Consolidated Steel & Wire Co.'s Cleveland mill, will be the general manager. He will be assisted by A. T. De Forest, formerly treasurer of the HP Nail Co. Michael Baackes will continue as general superintendent at the Consolidated mill. Thos. H. Taylor, formerly of the Washburn-Moen Co., Waukegan, will be superintendent at the old American mill. The HP mill will be in charge of Superintendent Ernst Boley, who was formerly in charge for the HP Nail Co.

THE sales agency of the electrical machinery manufactured by the Northern Electrical Mfg. Co., of Madison, Wis., has been given to Kohler Bros., with offices on the 16th floor of the Monadnock Block, Chicago. The Northern Electrical Mfg. Co. has been making extensive improvements in its plant, and also in its products, and is now prepared to furnish a complete line of motors for all classes of work. Its facilities for making machines for special requirements are unexcelled, and in this branch of its work the company has been making an unqualified success. A complete line of sample motors of the company's make will be exhibited at Kohler Bros.' offices. There are very few concerns in the country with a record as good as Kohler Bro.s' for sales. The firm has long been recognized as one of the first in the electrical business in Chicago, an has won an enviable reputation for perseverance and ability. The territory they will cover in the sales of the Northern machines includes Illinois, Iowa, Missouri, Indiana, Nebraska, Kansas, Kentucky, Tennessee, Michigan, Ohio, Pennsylvania, New Jersey, Maryland, Delaware and the District of Columbia.

JOINERS' RAPID CLAMP.

The clamp shown in the illustration is manufactured by the Samuel C. Tatum Co., of Cincinnati, and is entirely of iron and steel. The bar is smooth, without notches and the tail stock or sliding part can instantly be set against the work, which is a saving of considerable time to the operator. The bar is made to pass through the head piece, retaining its full length and lessening the possibility of breaking.

The 15 to 24-inch clamp has ⅞ x 1⅛-inch steel bars with crank handle and ⅝-inch screw, and these sizes are designed to be carried in any tool chest. They open 15, 18, 20 or 24 inches. It is stated that all bars are readily interchangeable and that in case of breakage, as the head is bolted to the bar, any parts can easily be replaced. A heavier and more powerful clamp is made for large work, using ¼ x 1½-inch steel for the bar, with ⅝-inch screw and crank handle. These clamps are made in three sizes, to open 3, 4 and 5 feet. For car works and other requirements where an especially strong and long clamp is needed, a somewhat heavier clamp is made on the same principle, with a steel bar ⅜ x 1¾ inches, and a proportionately strong screw and crank handle. Three sizes of the largest clamps are made to open 6, 7 and 8 feet.

JOINERS' RAPID CLAMP.

The Use of Hard Steel.—*Engineering*, March 4, has an editorial on the use of steel in which attention is called to the increasing application of the harder varieties for important purposes where only the milder grades were supposed to be allowable. Thus in steel rails the latest specifications of the New York Central are quoted as demanding a 100 lb. rail running .65 to .70 in carbon. To this departure, also, may be laid the excellent service given by steel axles under continually increasing wheel loads. The experience of Mr. Metcalf is quoted, in finding a rod with 0.97 carbon giving the best service in steam hammers. Bicycle tubing shows similar results. The difficulty in using hard steels for structural purposes lies in the trouble experienced with them in the workshop. Punching and shearing are very difficult and attended with ruinous results to the material. While the working range of the soft steel does not increase as fast as the ultimate strength, with the hard grades this is the reverse, a spring steel having its elastic limit raised very considerably by the hardening process. For practical purposes it may be said, in fact, that the elastic limit is raised up to the breaking point of the hard steel, and this point is unaltered by the hardening treatment. This is further confirmed by tests made on hard drawn piano wire, where the results obtained ran up to 270,000 pounds per square inch for the elastic limit, and from 290 to 335,000 for the ultimate strength. The banner test was that of a wire broken at the Watertown Arsenal, which gave way at 460,000 pounds per square inch. Bauschinger has proven that the elastic range of a metal, and the safe working stress are intimately connected, and Dr. Pole's observation that the elastic range is increased by hardening as well as the elastic limit is therefore of great value. The whole process of tempering springs derives its advantages from this fact. The only use for hardened steel so far in the arts has been for hard-drawn steel wires for cables on bridges. The chief advantage here is the obviation of danger from flaws, the subdivision of the metal being so great; for a flaw in hard steel is very much more dangerous than in mild, since an unyielding metal gives no notice of coming failure.

THE mineral production of Alabama for January, as reported to Eugene A. Smith, State Geologist, is as follows: Coal, 579,731 tons; coke, 99,911 tons; pig iron, 83,873 tons; iron ore, 186,523 tons; limestone and dolomite for flux, 64,390 tons; lime, 11,138 barrels. For February the reports show the following totals: Coal, 513,732 tons; coke, 110,158 tons; pig iron, 80,764 tons; iron ore, 178,682 tons; limestone and dolomite for flux, 55,030 tons; lime, 13,481 barrels.

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INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants :—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

W. A. Cochrane, formerly of Leechburg, Pa., has been in New Kensington, Pa., recently for the purpose of organizing a company to manufacture chilled and sand rolls and hot neck brass. The contemplated works will be 90 feet wide by 200 feet long with two 25-ton electric traveling cranes, two air furnaces, and lathes to machine the product. The mill will be fitted up in modern style and thoroughly equipped in all departments. Mr. Cochrane was the founder of the Leechburg Foundry & Machine Co. and was its president and superintendent for eight years. In the past three years he has been interested in the manufacture of chilled rolls and brasses.

The Economy Light & Power Co., Joliet, Ill., is in the market for a 300 to 400-h. p. high speed automatic engine with double fly-wheel, 20 to 24-inch face, tandem compound preferred. State lowest price f. o. b. Joliet.

The New Kensington roll foundry, for the manufacture of the Cochrane chilled rolls, will begin operations about Oct. 1. The company has secured a site on the river front in Parnassus, Pa., and will break ground for buildings at once. The company is capitalized at $60,000.

The Lakeside Malleable Iron Co., Racine, Wis., has been incorporated with $17,000 capital, by Wm. Horlick, David G. Janes and Thomas T. Wood.

The Godman Mfg. Co., Anderson, Ind., which is erecting a plant of stone, brick and iron, to cost $40,000, is in the market for corrugated iron, shafting pulleys, wood and iron-working machinery, nickel plating and japanning apparatus, cupola, malleable furnaces and other foundry supplies, and gas engines.

The Kentucky Machinery Co., composed of Louisville, Ky., and New Albany, Ind., capital has leased the old Monon shops in New Albany. Foundry and machine shops will be operated in manufacturing several iron specialties.

The Western Mattress Co., Lincoln, Neb., asks the address of makers of open-seam tubing.

The Lack Single tree Co., Paducah, Ky., is in the market for complete outfit for manufacturing wrought iron clips for single-trees, double-trees and neck-yokes; hammers, forges, shears, bending machines, for shaping hooks, etc.

The C. F. Hunt Co., of Indianapolis, Ind., has been incorporated to deal in rod machines, iron pipe, etc., with capital of $40,000. The directors are C. F. Hunt, W. J. Stabler and J. S. Barth.

The McLean Air Pump & Machine Co., of New York City, has been incorporated, with a capital of $15,000. The directors are J. N. McLean, of 67 Centre st., and T. W. Heald, of New York City; G. C. Ainslee, of East Orange, and Otto Bernz, of Newark, N. J.

The International Engine Co., Charleston, W. Va., has been incorporated, with a capital stock of $200,000, by Henry Shayless, C. P. Ruckdeschel, F. W. Boyle, and others, all of Philadelphia.

The Van Vlissingen syndicate, of Chicago, proposes to build a harbor, railroad and factory town north of Waukegan, Ill., in the Town of Benton.

The Willman Gasoline Engine Works, capital $20,000, will build a plant at Willman, Minn., for the manufacture of gasoline engines. The directors are A. E. Rice, J. S. Robbins, M. Jorgenson, S. B. Wale and Lars Halvorson.

The American Standard Steel Co. is the name of the new corporation which will build an open-hearth plant adjoining the rolling mill of Mitchell, Tranter & Co., Covington, Ky. The latter company, with a number of Cincinnati investors, will own most of the stock in the new enterprise. The capital will be $1,000,000—4,000 shares of preferred and 6,000 shares of common stock.

J. H. McKenna is about to erect a foundry in South Joplin, Mo.

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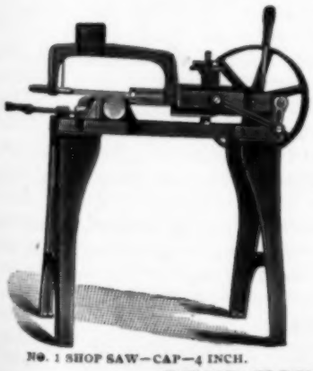

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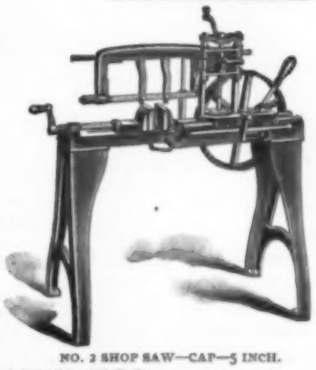

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"OTIS" FIRE-BOX PLATES A SPECIALTY.

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MONTREAL, J. G. Sibbald, 3 Windsor Hotel.
SAN FRANCISCO, John Woodlock, 26 Beale St.

New Construction:—

The new Allegheny plant of the Pennsylvania Car Wheel Co. was put in operation April 14—just 90 days after the new company was incorporated. The building erected is 77 x 275 feet, and as now equipped has a capacity of 275 wheels in 10 hours. The plant is so arranged that on short notice the capacity can be increased to 500 wheels per day. The first order to be filled is for the Schoen Pressed Steel Co., of Allegheny. It calls for wheels of special design for the 100,000-pound steel hopper cars which are being made for the Pennsylvania Railroad.

At Racine, Wis., work has begun on two buildings for the Lakewood Malleable Iron Co.—320 x 76 feet and 100 x 40 feet. They are located in the Janes addition south of the city.

Fox & Co. are building a machine shop at New Martinsville, W. Va., the main building being 40 x 100 feet.

The Philadelphia & Reading will build a machine shop at Tamaqua, Pa.

At Charlotte, Mich., G. H. Bond, of Jackson, Mich., and Chas. T. Scott will build a machine shop.

A new steel foundry is being erected by the Illinois Steel Co. The foundry work is now carried on in the South Works in the open-hearth building. The new building is 30 x 150 feet. Some large ingots have been cast for shafts, some of these weighing as much as 40 tons.

Specifications have been completed for the large steel plant to be erected at Birdsboro, Pa., for the Schuylkill Valley Steel Co., of 103 Walnut st., Philadelphia. Brick and steel construction and iron roof.

At Syracuse, N. Y., the Central City Brass & Mfg. Co. has begun work on some new buildings.

It is reported that J. A. Andrews & Bro., of the Newport (Ky.) Rolling mill, are contemplating the erection of two tin mills.

The Chicago Bridge & Iron Co., Chicago, has taken a permit for a $25,000 building.

At Chilton, Wis., Robt. Hippe is building a machine and boiler shop.

Additions, Enlargements, Removals, Etc.:—

The Canton Rolling Mill Co., Canton, O., is building an addition 75 x 140 feet and a boiler house 30 x 50 feet. Two boilers are being added to the present plant; the company already has all the other power necessary. The contract has been let to the Lloyd-Booth Co., of Youngstown, O., for two 24-inch hot mills and one roughing mill; the contract for boilers to Reeves Bros., of Alliance, O., and for the building to the Wrought Iron Bridge Co., of Canton. The Canton Rolling Mill Co. manufactures galvanized and black sheets—common, cold rolled, pickled and cold rolled, and stamping stock.

The Kutztown (Pa.) Foundry & Machine Co. is building an addition which will employ 25 more men. The product is boiler fronts and ornamental castings.

At Leeds, Ia., the Pioneer Stove foundry is building an addition.

The Pennsylvania Bolt & Nut Co., Lebanon, Pa., is building an addition, which will increase its output considerably.

The Sylvan Steel Co., Moline, Ill., is adding an open-hearth steel plant to its rolling mill, and proposes to manufacture its own steel.

The Waukesha Malleable Iron Co., Waukesha, Wis., has made an addition to its foundry 40 x 70 feet to enable more molders to be employed. The works are running 15 hours out of 24, including Sundays.

The Schoen Pressed Steel Co., of Pittsburg, builder of steel cars, will considerably enlarge its plant. At present it has a capacity for turning out 20 cars per day, and it is proposed to increase this to 50 cars. It recently purchased about 20 acres of land from the Oliver Iron & Steel Co., which will be utilized in making the additions.

Fires and Accidents:—

The Michigan Cutlery Co., Buchanan, Mich., sustained a fire loss of $7,000, April 6; insured.

The Wilhelm bicycle plant at Hamburg, Pa., valued at $100,000, burned; insurance is $60,000.

The Barton boiler works and foundry at Charleston, W. Va., burned April 8, with $8,000 loss.

The Oneida Farm Tool Co., Clayville, N. Y., whose recent fire caused a total loss, had about $40,000 insurance.

Fire at the coke plant of the Cambria Iron Co., Johnstown, Pa., caused by an explosion in the condensing department, resulted in $15,000 loss.

The carriage and wagon factory of the Chas. Abresch Co., Milwaukee, burned, with machinery, wagons, carriages, etc. Loss $110,000; insurance, about $80,000.

General Industrial Notes:—

Albion, Mich., citizens have a plan for retaining the plant of the Albion Malleable Iron Co., which contemplates branch-

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Machine Tools and Supplies. Send for list of Second-hand Tools.

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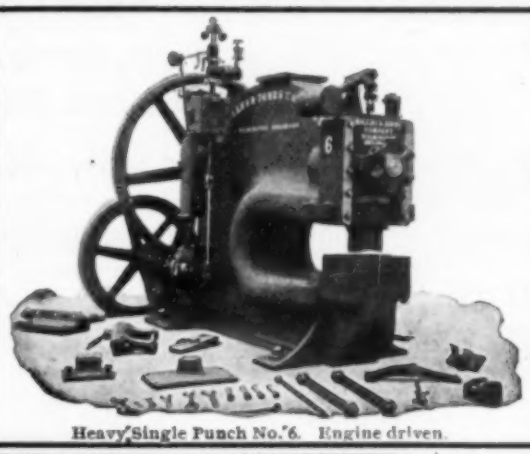

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PUNCHES and SHEARS,
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ing out. The city, which owns the present site of the company, is asked to deed it to a local improvement company, with the understanding that this company pay $10,000 to the Malleable Iron Co., and that the latter be bonded for $40,000 to put up a new plant. The improvement company will try to get another industry to take the old plant.

The Allegheny, Pa., water works department has let the contract for a 250-h. p. boiler to the Edgemoor Iron Co. and the Playford Stoker Co. at $6,152.

The Robinson Machine Co., Monongahela City, Pa., has on hand a contract for two engines for the Roane Iron Co., Rockwood, Tenn.

The Laidlaw-Dunn-Gordon Co., Cincinnati, has just shipped the largest pumping outfit ever constructed for a private establishment to Wanamaker's, Philadelphia. It will supply power for 35 elevators.

The starting of the puddle department of the Pottstown (Pa.) Iron Co. by the Glasgow Iron Co., lessees, adds 100 men to the force.

A mortgage for $126,200 has been filed against the Pottsville (Pa.) Iron & Steel Co., plant, which is soon to be sold by the sheriff.

W. P. Snyder & Co., of Pittsburg, issued a foreign attachment last week to recover $15,000 from W. J. Rainey, the coal and coke operator. The money is alleged to be due for the failure of the defendant to comply with the terms of a contract to furnish coke at $1.20 a ton.

John Hoge and 20 other stockholders, representing $100,000 of the $500,000 of the capital stock of the Ohio Iron Co., petitioned court at Zanesville, O., last week for a receiver for the company. They allege that the concern is $130,000 in debt, has lost its trade and credit and is on the verge of insolvency.

Last week the Westinghouse Machine Co. had a rush order for an immense engine for a New Hampshire firm, and the machinery was sent through on fast freights over the Pennsylvania and the New England lines, and the run was made in four days and ten hours. One big casting weighed 45,000 pounds, and had to be placed directly over the trucks, and it occasioned much trouble from hot boxes.

Shipments of coke have been made to Mexico recently by Connellsville and West Virginia operators. The *Courier* notes that in the past few weeks 4,800 tons of Frick coke have gone to Mexico. The Davis Coal & Coke Co. has shipped 1,800 tons.

The R. W. Tanner & Co. foundry at Dolgeville, N. Y., in which Alfred Dolge had a considerable interest, has curtailed operations since his assignment.

Inability to get malleable castings has caused a partial curtailment of operations by the Bradley implement works at Bradley, Ill.

The Rigby Mfg. Co., of Pittsburg, has been organized by Rigby Bros., of Wheeling, and P. H. Weaver and E. F. Austin, of Pittsburg. The company will make a frictionless rod packing patented by C. F. Rigby.

The National Foundry & Pipe Works, Ltd., of Pittsburg has secured a contract from the city of St. Johns, New Brunswick, for 4,000 tons of water pipe. Shipment will be made by sailing vessels from New York during the first days of May.

The Bethlehem Iron Co., South Bethlehem, Pa., has taken the order for shafts for the engines the Metropolitan Traction Co., of New York City, will install in its new power house. These shafts are 37 inches in diameter, 27 feet 4 inches long, with a 16-inch hole through them. They are made of fluid compressed open hearth steel, annealed, and are hydraulically forged on a mandrel. The Bethlehem Iron Co. has the only forge in this country equipped for turning out work of this character and magnitude. The cranks will also be made at South Bethlehem.

The Raney & Berger Furnace at New Castle, Pa., recently purchased from the Norway Iron & Steel Co. by the Shenango Valley Steel Co. has two stacks, but blowing capacity is only sufficient for one stack at a time. Plans are in contemplatio

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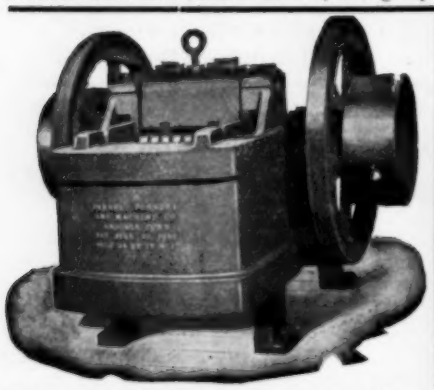
Regenerative Gas Furnaces and Water Seal Gas Producers.

Producer Gas under Tubular Boilers, saving 20 per cent in fuel. NO SMOKE.



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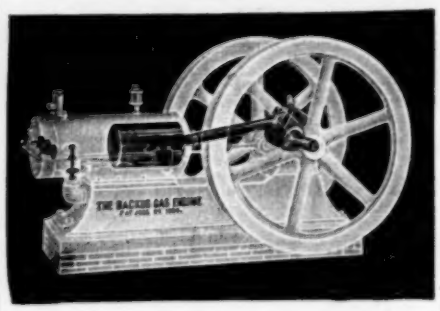

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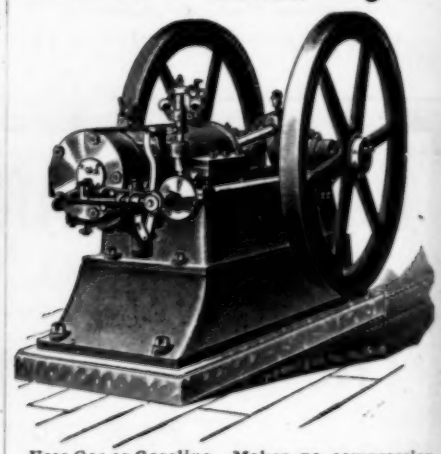

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Columbus Machine Co.,

COLUMBUS, O.

for the erection of four stoves, the purchase of new blowing engines and the operation of both stacks. This, with the Red Jacket Furnace, whose entire product the steel company now uses, together with that of the one Norway stack, will give the company 900 to 1,000 tons a day from its own furnaces.

The 30-ton, six-inch steel gun cast at the Otis Steel Works, Cleveland, last August, under the direction of Dr. R. J. Gatling, has been finished. It was shipped to the Washington Navy Yard this week. It will be rifled and taken to the Indian Head proving grounds to be tested.

Sugar factory work has made the West Point Foundry of J. B. & J. M. Cornell, at Cold Spring, New York, very busy. The large work of the company is handled at this plant and shipments have run several hundred tons in a week.

The Shaw Electric Crane Co., Muskegon, Mich., is busy. Several orders for electric hoists to be used in connection with various Government fortifications are being rushed.

The Humbert Tin Plate Co., of South Cornellsville, Pa., will give up, on May 1, its lease of the tin plate plant of the Stickney Iron Co. at Baltimore, Md., the return not justifying the investment. There is still talk of enlarging the Connellsville plant from four to six mills.

The employes of the Shelby Tube Co., at Greenville, Pa., have received an unasked advance. The men at the drawing benches received a 10 per cent advance, those in the annealing, pickling and finishing departments 20 per cent, the machinists 10 per cent, and the plier boys 20 per cent.

McPherson, Willard & Co., who have a large plant near Philadelphia, have leased for four months the Paterson, N. J., Iron Co. works of S. S. Sherwood, receiver. They have a large order for forgings from Honolulu.

At the works of the Pennsylvania Steel Co., Steelton, Pa., March was the heaviest month in production for a number of years, and in the merchant and billet mills the output surpassed any previous records. A contract was received for heavy forgings for Government use. Every department of the plant is working day and night to its full capacity.

The Marinette Iron Works, at West Duluth, Minn., were sold under foreclosure of mortgage, April 2, to George P. Knowles, of Superior, Wis., acting for the bondholders, who bid $2,100. The original cost was nearly $200,000.

The Dake Engine Mfg. Co., of Grand Haven, Mich., is turning out a hoisting engine for shipment to Panama, to be used in the mahogany forests of Central America.

The Anderson Nut & Bolt Works, of Anderson, Ind., has resumed operation of its works after a short shut-down for repairs.

The American Steel Casting Co., Sharon, Pa., has shipped a 14-ton roll to the Wheeling Steel & Iron Co.

Furnace No. 2 of the Sheffield (Ala.) Coal, Iron & Steel Co., has been blown in.

The Troy Steel Co.'s plant at Breaker Island, Troy, N. Y., which closed down in December, is still idle, and plans for future operations are not matured. Vice-President Bell says that the plant will be run, but that time will be required to perfect arrangements. The erection of a by-product coke plant is under consideration.

The Payne Engineering Co.'s plant at Elmira, N. Y., is starting up on a contract for projectiles and ammunition.

At Cincinnati, April 12, the American Tool Works Co. was organized, succeeding the Davis & Egan Machine Tool Co. The directors were elected and organized by making Charles Davis president, B. B. Quillen vice-president, Henry Luers secretary and treasurer, and these, with Robert Laidlaw and Thomas P. Egan, constituting the board of directors. The capital is $1,000,000